

ATTACHMENT A

**USTA COMMENTS
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**ACCESS REFORM AGAIN:
MARKET-BASED REGULATION, PRICING FLEXIBILITY
AND
THE UNIVERSAL SERVICE FUND**

by

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I. INTRODUCTION

1. My name is William E. Taylor. I am Senior Vice President of National Economic Research Associates, Inc. (NERA), head of its telecommunications economics practice and head of its Cambridge office. I received a B.A. degree in economics, *magna cum laude*, from Harvard College in 1968, a master's degree in statistics from the University of California at Berkeley in 1970, and a Ph.D. in Economics from Berkeley in 1974, specializing in industrial organization and econometrics. I have taught and published research in the areas of microeconomics, theoretical and applied econometrics, and telecommunications policy at academic institutions (including the economics departments of Cornell University, the Catholic University of Louvain in Belgium, and the Massachusetts Institute of Technology) and at research organizations in the telecommunications industry (including Bell Laboratories and Bell Communications Research, Inc.). I have participated in telecommunications regulatory proceedings before state public service commissions, the Federal Communications Commission ("FCC") and the Canadian Radio-Television and Telecommunications Commission concerning access charges, competition, incentive regulation, productivity growth, telecommunications mergers and pricing for economic efficiency. My articles have appeared in numerous telecommunications industry publications as well as *Econometrica*, the *American Economic Review*, the *International Economic Review*, the *Journal of Econometrics*, *Econometric Reviews*, the *Antitrust Law Journal*, *The Journal of Regulatory Economics*, *The Review of Industrial Organization*, and *The Encyclopedia of Statistical Sciences*. I have served as a referee for these journals (and others) and the National Science Foundation and as an Associate Editor of the *Journal of Econometrics*.

2. I have been asked by the United States Telephone Association ("USTA") to comment on the economic issues raised in the FCC's October 5, 1998 *Public Notice* which seeks to update and refresh the record upon which the FCC contemplates acting to adapt its access charge

regime once again to changed circumstances.¹ In particular, the FCC invites comments regarding (i) the desirability of modifying the Commission's market-based approach to the regulation of access charges by represcribing access charges to cost-based levels, (ii) the continued applicability of a permanent price cap plan with a productivity offset (X) of 6.5 percent, and (iii) the usefulness of measured, triggered and phased access pricing flexibility proposals as different geographic and service markets are opened to competition at different rates and at different points in time. I also address comments on these issues raised by MCI in its recent petition for a return to prescriptive access charge regulation based on forward-looking economic costs.²

II. PRESCRIPTIVE REGULATION OF CARRIER ACCESS CHARGES

3. Just nine months after the Commission implemented the results from its multi-year review of access charges and price cap rules, the Commission should not open the door to consider additional prescriptive access charge reductions. The Commission correctly and explicitly rejected such an approach in its recent review.³ In particular, it acknowledged the possibility that competition may not drive access prices to cost everywhere at once:

We are confident that the pro-competitive regime created by the Act and implemented in the *Local Competition Order* and numerous state decisions will generate workable competition over the next several years in many cases, and

¹ *Public Notice*, FCC-98-256, "Commission asks parties to update and refresh record for access charge reform and seeks comment on proposals for access charge reform pricing flexibility," CC Docket Nos. 96-262, 94-1, and RM-9210, released October 5, 1998 ("Public Notice").

² MCI's view of the current state of interstate access charge reform is presented in a petition to the FCC and an accompanying document *Absence of Competition in the Exchange Access Market* ("MCI Report"), both dated May 7, 1998. The petition and the MCI Report follow a Petition for Rulemaking filed on December 9, 1997, by the Consumer Federation of America, the International Communications Association, and the National Retail Federation ("CFA/ICA/NRF Petition"). MCI's petition and, in particular, the MCI Report state why, in MCI's view, a radical departure from the FCC's current policy on interstate access charge reform has become necessary. Specifically, MCI reiterates an earlier call by the CFA/ICA/NRF Petition to return to a "prescriptive" approach for setting the prices of those access services.

³ *In the Matter of Access Charge Reform, Price Cap Performance Review for Local Exchange Carriers, Transport Rate Structure and Pricing and End User Common Line Charges*, First Report and Order, CC Docket Nos. 96-262, 94-1, 91-213, and 95-72, released May 16, 1997 ("Access Reform Order").

we would then expect that [*sic*] access price levels to be driven to competitive levels. We also recognize, however, that competition may develop at different rates in different places and that some services may prove resistant to competition. [¶ 48]

In addition, the Commission put in place a specific “backstop” mechanism:

[W]e also adopt a prescriptive “backstop” to our market-based approach that will serve to ensure that all interstate access customers receive the benefits of more efficient prices, even in those places and for those services where competition does not develop quickly. To implement our backstop to market-based access charge reform, we require each incumbent price cap LEC to file a cost study no later than February 8, 2001, demonstrating the cost of providing those interstate access services that remain subject to price cap regulation because they do not face substantial competition. [¶ 267]

While the Commission reserved the right to require submission of such studies at an earlier date if “competition is not developing sufficiently for our market-based approach to work,” the date itself was chosen to coordinate with other events the Commission considered to be prerequisites to its market-based approach:

We have chosen this date in order to give competition sufficient time to develop substantially in the various markets for interstate exchange access services. We have also chosen this date to permit us and all interested parties to take into account the effects of implementing the substantial changes that we adopt in this Order and that we will be adopting elsewhere to satisfy the universal service goals in section 254. By this date, we also expect to have additional regulatory tools by which to assess the reasonableness of access charges...

We anticipate that the pro-competitive regime created by the 1996 Act, and implemented in the *Local Competition Order* and numerous state commission decisions, will generate competition over the next few years. Further, it would be imprudent to prejudge the effectiveness of those measures at creating competitive local markets. Rather than ignore or interfere with the effects of this developing competition on prices for interstate access services, we find that the public interest is best served by permitting emerging competition to affect access charge rate levels. In addition, the experience we gain from observing the effects of emerging competition on interstate access services will permit us more effectively and efficiently to implement any prescriptive measures that may be needed in the future to ensure that interstate access services remaining subject to regulation are priced in accordance with the forward-looking economic cost of providing those services. [¶¶ 268-269]

4. Elsewhere in the *Access Reform Order*, the Commission observed that a market-based approach might take “several years to drive costs to competitive levels” (§ 45), that accurate forward-looking cost models were not currently available (§ 45), that dramatic cuts in access charges for some companies could be disruptive even when new universal support mechanisms were in place (§ 46), and that pricing flexibility for access was required by the market-based approach and an order from the Commission was forthcoming (§ 49). It was thus contemplated in the *Access Reform Order* that events such as the availability of accurate cost models, completion of the Universal Service docket and experience under pricing flexibility for access would take place before the market-based approach to access charge reform could be examined. In particular, market-based reform of access charges would only make sense after the universal service fund has removed the implicit support for basic service. Otherwise, enhanced competition would simply bid away the revenue that was used to support low basic exchange rates, leaving the ILECs with inefficiently low local rates and no access revenues with which to support them.⁴ The Commission thus relied appropriately on the simultaneous forces of market competition and universal service reform to move access rates—not all at once, but over time—to levels that would likely prevail in competitive markets for access.

5. No intervening events have occurred to cast doubt on these conclusions. Universal service support mechanisms are not currently in place, there is no agreed-upon method for calculating forward-looking economic costs for network elements, let alone for basic exchange or carrier access services, and there has been no experience of competition under flexible pricing for access services.⁵ Thus, concerns that competition may have developed more slowly than anticipated for carrier access services are premature.

⁴ However, it has placed its faith appropriately in the twin forces of market competition and universal service reform to move access rates—not all at once, but over time—to levels that would likely prevail in competitive markets for access. Just because the market cannot, by itself, produce an instantaneous rebalancing to competitively-set access rates does not imply that market forces should be summarily abandoned in favor of heavy-handed and counter-competitive regulation.

⁵ The FCC has repeatedly acknowledged its lack of the necessary information regarding the size of the implicit subsidy. Most recently, it stated: “... we conclude that a process that eliminates implicit subsidies from access charges over time is warranted ... First, we simply do not have the tools to identify the existing subsidies (continued...) ”

A. The market-based approach is superior to the prescriptive approach

6. The fundamental limitation of a prescriptive approach is that it is static in nature and is likely to fail to adapt to continually changing supply and demand dynamics—thus confounding desirable market outcomes. Administrative rigidity virtually ensures efficiency losses. Most prescriptive approaches are characterized by “regulatory lag”—*i.e.*, a delay between the enactment of a regulation or policy and its implementation. Regulatory lag could make the prescriptive approach ineffective and even counter-productive in an environment in which market conditions change even before the new regulation/policy is implemented. Firms constrained by the slow-moving regulatory process cannot behave competitively or be market-responsive. A prescriptive approach would, therefore, actually be a drag on competition and reinforce the perception that competition is not developing in the local exchange.

7. Even without regulatory lag, the inexorable operation of market forces and the unbundling requirements of the Act could make the prescriptive approach unsustainable in the long run. For example, a prescriptive approach which is intended to move current access rates by a certain amount over a five-year period could fail utterly if market forces presently unanticipated—*e.g.*, new developments in technology or marketing channels—ended up either constraining or preventing those price changes. A prescriptive approach could only work in an environment in which market forces are minimal or non-existent and change could not be introduced except by regulatory means. With the implementation of the Act’s pro-competitive and market-oriented provisions, it would be almost impossible for any prescriptive approach to succeed or to co-exist with market forces.

8. Reliance on market forces would permit use of more efficient mechanisms to recover shared and common costs, including volume and term discounts and other forms of non-linear pricing that would be hard to employ under a more prescriptive approach. Market forces more closely

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precisely at this time. Second, we prefer to rely on the market rather than regulation to identify implicit support because we are more confident of the market’s ability to do so accurately.” *Access Reform Order*, ¶ 9 (emphasis (continued...))

align consumer preferences and taste with costs than can ever be expected under a prescriptive approach—thus greatly improving efficiency. The benefits from such an alignment would be largely unavailable from tinkering with X-factors or arbitrarily prescribing rates and restricting pricing flexibility.

9. A prescriptive approach would significantly increase the involvement of regulatory agencies precisely at a time when competition and market forces should be the principal mechanisms for determining efficient output levels. Ironically, a full and diligent application of the prescriptive approach would commit the FCC to taking on new regulatory obligations such as the micro-management of all incumbent local exchange carrier (“ILEC”) interstate services and rates. Just when the FCC should be shedding those responsibilities and encouraging market forces to direct service provision and pricing, the prescriptive approach (accompanied by protracted and contentious litigation) would simply raise the cost of regulation and arrest the pro-competitive forces sought to be unleashed by the Act.

10. Any use of a prescriptive approach for moving current access rates to competitive levels would require the FCC to make two very difficult judgements. First, it would have to determine the levels that access prices would reach naturally in a competitive market. Second, it would have to determine the true economic cost of the access services. These are both easier said than done in today’s enormously complex telecommunications industry in which ILECs are mostly large multiproduct firms that experience economies of scale and scope. Even if the FCC were to accumulate information regarding ILEC costs and prices through the usual rulemaking process, it would simply not be possible for a single regulatory agency to simulate all the nuances and complexities of a competitive market process. The great virtue of market forces is that they are beyond the control of any single firm, customer, or government agency. Market outcomes, in effect, are the result of thousands of competitive interactions and transactions—something a single agency can never properly emulate. Therefore, *as long as the*

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added).

industry is to remain open to market forces, it would only be pointless and futile to employ a prescriptive approach (based on incomplete or imperfect information) to determine costs and prices. For example, while total service long run incremental cost ("TSLRIC") may provide an appropriate price floor, it cannot be a good estimate of the market price of access in a competitive, unregulated market. For a multiproduct firm with substantial fixed costs, incremental cost pricing is unsustainable in the long run and does not allow a firm to recover all of its economic costs of production. Allowing market forces to determine how shared and common costs should be recovered would result in more efficient pricing than a mechanism that arbitrarily allocates shared and common costs to services.

11. In the ultimate analysis, only the market-based approach to determining the course of interstate access prices is consistent with the direction set by the Act. While the FCC's interest in coordinating access reform with universal service reform is understandable, the market-based approach would remain the proper policy instrument even without parallel reforms in the funding of universal service.

B. More prescriptive regulation would undermine the incentives of the price cap plan.

12. In its review of price cap regulation, the Commission recognized the beneficial impact of the incentives of price cap regulation. A prescriptive approach to access reform is a return to cost-based rate of return regulation and a repudiation of price cap regulation. If the Commission were to force rate reductions in excess of the newly imposed X factor, it would have disastrous effects on price cap regulation. Such actions would undermine regulatory credibility and disrupt long run market dynamics. In addition, any link, however tenuous, between the regulated firm's success in the market and the maximum price it is permitted to charge in the next period would re-establish the perverse incentives that price cap regulation was designed to avoid. As a result, the rational regulated business would have significantly diminished incentives to increase investment and improve efficiency.

C. Irrespective of the development of competition, there is no economic need for prescriptive reductions in access charges.

13. The Commission rejected a prescriptive approach in part because it concluded that any reductions in rates should avoid large one-time changes and should instead be addressed over a period of years. The current price cap regulation already accomplishes this goal. On average, the price cap index falls by inflation less 6.5 percent per year. Moreover, as competition spreads, competitive services will be increasingly removed from price cap regulation so that the regulated local exchange carrier will have fewer services over which to distribute the annual price cap reductions. Thus, the downward pressure on the price of the less-competitive services remaining under price cap regulation will increase. Moreover, the low current and forecasted U.S. inflation rate implies that carrier access prices must fall in both nominal and real terms over time even for customers or geographic areas where competition is more limited.

1. Access prices have fallen significantly over time

14. Average interstate switched carrier access charges have fallen at an annual rate of about 10 percent per year since price cap regulation began.

Figure 1

Figure 1 shows the history.⁶ During this period, annual inflation averaged about 3 percent, so that interstate access charges have fallen in real terms (relative to inflation) at about 13 percent per year.⁷

15. Specific examples of impressive reductions in access charges that have occurred over the last decade abound. For example, one RBOC's total rate for two ends of access (*i.e.*, originating plus terminating) has fallen from over 7.8¢ per minute in August 1988 to 3.6¢ per

⁶ Data taken from Attachment B to USTA's *Comments* in this Docket.

minute in May 1998: a reduction of 54 percent. When the subscriber line charge and the PICC are added back to that access rate, the resulting total two-ended rate is still only 4.2¢ per minute: a reduction of 47 percent over 10 years. More telling is the reduction in that RBOC's *terminating* access charge over that decade: from almost 6¢ per minute to just under 1.4¢ per minute, or a reduction of 77 percent. This is hard evidence of a different market reality than the one portrayed by the IXC's who wish to be viewed as hapless captives of monopoly LEC providers of terminating switched access.⁸

2. The level of access prices is reasonable.

16. Though switched access charges may be falling, IXC's still complain about their level. For example, MCI's petition alleges that a year after the *Access Reform Order* was issued, interstate switched access charges remain \$10 billion too high annually nationwide and are causing significant losses in consumer welfare. That estimate of excess access charges has been presented to the FCC before, but the FCC declined to reduce access rates by that amount in one fell swoop.⁹ Instead, the FCC induced substantial reductions in switched access charges by implementing a more efficient access rate structure. By shifting recovery of non-traffic sensitive costs away from usage-based recovery, interstate access charges nationwide were reduced by \$1.7 billion on July 1, 1997, and by \$700 million on January 1, 1998.¹⁰ Future reductions are anticipated as (i) implicit subsidies are removed from access rates with the phasing in of universal service reform and (ii) the normal operation of price cap regulation progressively reduces the price cap indices forcing access rates downward.

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⁷ Part of the reduction in switched access charges was caused by shifts in cost recovery—from per-minute switched access charges to subscriber line charges ("SLCs") and presubscribed interexchange carrier charges ("PICCs")—rather than cost reductions.

⁸ MCI Report, p. 19.

⁹ *Access Reform Order*, ¶ 290.

¹⁰ "USTA: IXCs are Failing to Cut Per-Minute Rates," *Telecommunications Reports*, February 16, 1998.

17. MCI's estimate of an alleged \$10 billion excess in access charges is based in part on an estimate of forward-looking economic cost for switched access of 0.4¢ per minute produced by the HAI 5.0a cost model.¹¹ There is no independent confirmation yet of this estimate of cost or the resulting MCI estimate of excess access charges. In fact, the HAI 5.0a cost model and its many predecessors (in the line, generally, of Hatfield cost models) have been disputed and criticized in numerous forums including state regulatory proceedings on universal service and interconnection and unbundled element ("UNE") pricing. The FCC has not signaled any readiness on its part to accept the HAI 5.0a model or cost estimates produced by it, and has reserved judgment on the appropriate cost model to be used for the purpose of determining the forward-looking economic cost of serving rural, insular, and high cost areas.¹² Thus, even if it were appropriate to set prices at some measure of incremental costs, the Commission still lacks a reliable method to accomplish the task. Economic proxy models do not reflect the actual network and the manner in which it is used, and therefore would result in insufficient prices and a disincentive for entrants to invest. Moreover, current models are not developed for rural areas where competition has been slowest to develop, leaving the Commission the least information to prescribe rates where competitive pressures on prices are smallest.

18. The issue of whether access charges should be reduced prescriptively should not become confused with the measurement of the alleged excess in those charges. There is no real disagreement over the fact that ILECs' current access charges contain contribution toward the implicit subsidy for universal service. Rather, the relevant consideration is whether sufficient time has passed to allow concomitant universal service reforms the opportunity to make implicit subsidies explicit.

¹¹ *Ibid.*, p. 2, fn. 3. In October 1996, AT&T also projected the same forward-looking cost of switched access using a similar model and methodology. Letter from Bruce K. Cox, Government Affairs Director, AT&T, to William F. Caton, Acting Secretary, FCC, in CC Docket No. 96-45, October 9, 1996.

¹² The FCC appears to have specifically ruled out for the time being adopting the methodology of the HAI 5.0a model for determining the forward-looking economic cost of switched access service. That model is supposed to estimate total *element* long run incremental cost ("TELRIC") i.e., the cost of an element, not a service. In contrasting what would be involved in calculating the forward-looking economic cost of access service with that
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3. Price cap LECs are not earning excessively.

19. IXC's cite the level and growth of the accounting earnings of the price cap LECs as support for the prescriptive reduction of access charges or an increase in the value of the productivity offset.¹³ For example, MCI's petition criticizes the price cap LECs for earning returns of 15.52 percent, exceeding the FCC-prescribed rate of return of 11.25 percent. The IXC's assert that access charges ought to be reduced prescriptively until LEC returns are reduced to no more than 11.25 percent or that the LECs' productivity offset be revised upward to eliminate their excess earnings and bring access charges down to cost.

20. This focus on accounting earnings in a price cap regime is unwarranted and unwise. First, increases in earnings under price caps are a sign of success, not failure. Higher accounting earnings under a price regime imply that the regulated firm has been able to reduce its unit accounting costs more rapidly than required by the target value of X. Customers—at least IXC's—receive an up-front, guaranteed benefit in the form of lower prices irrespective of the ability of the LEC to reduce its unit costs. The only sense in which any party appears to be harmed by an increase in earnings is a dog-in-the-manger fallacy: if it were known at the outset that the LEC would be able to reduce unit costs at the higher rate, a higher value of X could have been required at the outset. Such an argument defies logic. Price cap regulation only makes sense if the regulated firm is financially exposed to the full range of market outcomes produced by its skill or stupidity. If increased earnings come to be interpreted as a failure of price cap regulation, then price cap regulation will become little more than rate of return regulation in disguise. Second, the inference that prescriptive regulation or a higher value of X is warranted because of high or increasing accounting earnings is inimical to the incentives

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involved in calculating the TELRIC of a UNE, the FCC has clearly ruled out applying the TELRIC principle to switched access service. *Access Reform Order*, ¶ 45.

¹³ MCI has recently demanded that the X-factor be reset to 8.5 percent. (Letter from Mary L. Brown, Senior Policy Counsel, MCI, to Magalie Roman Salas, Secretary, FCC, June 1, 1998.) In a similar *ex parte*, AT&T demanded that X be reset at 9.3 percent. (Letter from Albert M. Lewis, Esq., Vice President-Federal Government Affairs, AT&T, CC Docket 94-1, May 20, 1998.)

intended under price cap regulation. The manager of a regulated firm must be able to face her accountant at the end of a successful month without fear that increased reported earnings will trigger regulatory retaliation. Otherwise, price cap regulation is no better than rate of return regulation with an institutionalized lag.

21. Third, regulatory accounting distorts both the level and growth of price cap LEC earnings. When accounting rates of return are adjusted to approximate economic rates of return, the actual rate of return achieved by price cap LECs during the 1991-1995 period averaged only 8.75 percent.¹⁴ The same study showed that between 1991-1997, price cap LEC earnings grew at a 4.8 percent annual rate, while overall U.S. corporate after-tax earnings rose at a 12.2 annual rate and earnings per share of the S&P 500 companies grew at an annual 16.5 percent rate. Thus, on a comparable basis, neither the level nor the growth in price cap LEC interstate earnings is out of the range observed in unregulated competitive markets.

22. The FCC has itself rejected these arguments about LEC rates of return in the most explicit terms. For example, in its *Access Reform Order*, the FCC stated:

In declining to reinitialize PCIs on the basis of carriers' rates of return, we reject GSA/DOD's suggestion that access rates have been excessive merely because the earnings of most price cap carriers have exceeded 11.25 percent, and, in some cases, by substantial amounts. When the Commission adopted price cap regulation, it specifically *permitted price cap carriers to earn in excess of 11.25 percent* in order to encourage them to become more productive. ... In addition, we found in the *LEC Price Cap Performance Review Order* that access rates declined substantially under price cap regulation from 1991 to 1994, in spite of the earnings to which GSA/DOD alluded [¶ 293, footnotes omitted, emphasis added].

On another occasion, the FCC outlined its vision of how price cap LEC performance relates to the transition to competition:

¹⁴ *Ex parte* letter to Richard Metzger, Jr., Chief, Common Carrier Bureau, FCC from Lawrence E. Sarjeant, Vice President Legal and Regulatory Affairs, USTA, CC Docket Nos. 94-1 and 96-262, May 29, 1998. Ironically, when the FCC evaluated AT&T's performance under its price cap plan, AT&T strongly resisted the use of the
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We find that reducing our regulatory reliance on earnings calculations based on accounting data is essential to the transition to a competitive marketplace, where forward-looking costs are central to decision making.¹⁵

23. The FCC's rejection of requests to force price cap LEC accounting returns down to 11.25 percent remains just as valid today. To repair the broken link between accounting costs and prices would be a regulatory step in an untenable direction, clearly harming the efficiency and productivity-enhancing incentives offered by price cap regulation. As the FCC has itself noted, access rate reductions during the LECs' price cap era have been substantial. Any change of course would risk losing the enormous benefits from such reductions in the future.

4. There is no economic basis to drive access prices to incremental cost.

24. Intoxicated with TELRIC-based prices for interconnection and UNEs, the IXC's enthusiastically urge similar treatment for carrier access services. However, nothing in economic theory suggests that multiproduct firms in competitive markets price services at forward-looking incremental cost or even at forward-looking incremental cost marked up by some arbitrary allocation of shared fixed and common costs. Firms in competitive markets recover such costs where market conditions—not accounting conventions—permit. TSLRIC is an appropriate price *floor*, (averaged over all the different prices charged for different units of a service) but it is not a good estimate of the level of the market price of carrier access in a competitive unregulated market.¹⁶ A market-based approach reveals the economic cost of access, not as the sum of a TSLRIC study and an allocation of fixed costs, but as the level to

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same accounting returns concept that AT&T and MCI urge be applied to the price cap LECs. See Comments of AT&T, *Price Cap Performance Review for AT&T*, CC Docket No. 92-134, 1992.

¹⁵ *In the Matter of Price Cap Performance Review of Local Exchange Carriers and Access Charge Reform*, Fourth Report and Order in CC Docket No. 94-1 and Second Report and Order in CC Docket No. 96-262, released May 21, 1997, ¶¶ 150 ("Fourth Report and Order").

¹⁶ Recall that prices are said to be "subsidy-free" if they fall between stand-alone cost and total service long run incremental cost. See, e.g., G.R. Faulhaber, "Cross-Subsidization: Pricing in Public Enterprises," *American Economic Review*, 65(5), 1975, pp. 966-977.

which competitive pressure forces access prices. As the Commission recognized, “competition will do a better job of determining the true economic cost of providing such services.”¹⁷

25. For a multiproduct firm with substantial fixed costs, incremental cost pricing is unsustainable in the long run and does not allow a firm to recover all of its economic costs of production. Experience from other industries—including the U.S. long distance industry—indicates that in the face of significant fixed costs, prices systematically exceed incremental cost. For example, revenue per minute for interstate, interLATA domestic direct-dialed calls from a random sample of residential customer bills averages about \$0.20 per minute between November 1997 and July 1998.¹⁸ During that period, carrier access charges averaged between \$0.04 and \$0.05 per minute, and a reasonable estimate of forward-looking incremental costs would fall between \$0.01 and \$0.02 per minute.¹⁹ Residential long distance service is thus currently priced at more than three times incremental cost, and the contribution (price less incremental cost) per minute in residential interstate long distance service (\$0.13-\$0.15 per minute) far exceeds the contribution per minute in carrier access charges (\$0.04-\$0.05 per minute).²⁰ Even assuming carrier access price reductions were passed through to customers in toll price reductions, the welfare gains from reducing carrier access charges to cost are swamped by the possible welfare gains from reducing the margin paid by residential toll users.

¹⁷ *Access Reform Order*, ¶ 265.

¹⁸ The data comes from Market Facts, Inc., and PNR and Associates, Inc., *MarketShare Monitor*, September 9, 1998. The database also contains customer weights, which we use to make the sample representative of U.S. households. The results are reported in P.S. Brandon and W.E. Taylor, “AT&T, MCI, and Sprint Failed to Pass Through the 1998 Interstate Access Charge Reductions to Consumers,” filed *ex parte* in CC Docket No. 96-262 on behalf of the United States Telephone Association, October 22, 1998.

¹⁹ Incremental toll cost estimates range from 1-2 cents per minute at the low end to about 6-7 cents at the high end. The higher values include non-network costs such as overhead, customer and marketing costs—not all of which are likely to be properly included in the incremental cost of offering the service. See, e.g., R.W. Crandall and L. Waverman, *Talk is Cheap*. Washington: The Brookings Institution, 1995, pp. 143-144.

²⁰ AT&T economists cite incremental costs of carrier access between 1/3 and 1/2 cents per minute. They are silent on the question of long-distance incremental costs. D. Kaserman, J. Mayo, M. Crew, N. Economides, G. Hubbard, P. Kleindorfer and C. Martins-Filho, “Local Competition Issues and the Telecommunications Act of 1996,” prepared on behalf of AT&T, July 15, 1996, p. 27.

26. It would make no sense to impose an alleged standard of pricing in competitive markets (setting prices at forward-looking incremental costs) when the current markup on switched access prices is smaller than that for residential toll services (net of access). Allowing market forces to determine how shared fixed and common costs are recovered results in more efficient prices than when the Commission arbitrarily allocates such costs or attempts to calculate forward-looking economic costs.

D. Local competition is emerging to constrain access rates.

27. Competitive entry is facilitated by the many interconnection agreements, and by the provision of network elements and resold services at regulated rates. Barriers to entry into the local exchange market have fallen, and large business customers can be targeted by entrants having few sunk costs. The value of the new competitive local exchange carriers ("CLECs") has also grown: evidence is the valuation placed on TCG by AT&T and on Brooks Fiber and MFS by MCI-WorldCom. Competitive access providers ("CAPs") are placing fiber at a faster rate than RBOCs

28. The presence and variety of local and exchange access competition throughout the U.S. should already provide regulators and competitors with assurance that the market-based approach to access reform is proceeding as intended. Competitors have access to a variety of substitutes to LEC provided access; competitive alternatives obviate the need to increase the regulatory pressure on ILECs to reduce access prices. Alternatives for CAPs and CLECs include the deployment of their own facilities, the use of ILEC UNEs and the opportunity to employ wireless technology.

1. CLEC access line growth accelerates while RBOC access line growth falls.

29. The impact of competition is already being felt. Competition for the business market has been quite successful: according to a recent analyst report from Salomon Smith Barney, in the

first quarter of 1998, CLECs as a group added more business access lines than did the RBOCs.²¹ Specifically, CLECs added 498,000 new business lines in that quarter (an increase of 221 percent over a year ago), while ILECs added only 461,000 new business lines (a decrease of 34 percent over a year ago).²² The Salomon Smith Barney report notes that the non-AT&T long distance competitors did not have more incremental minutes than AT&T until 1986, a full 10 years after MCI carried its first switched long distance minute. The report's conclusion is that:

[R]egulatory and public policy initiative toward opening up local markets has allowed the CLECs as a group to achieve in less than 2 years after the Telecom Act, what it took MCI and other alternative long distance carriers over 10 years to achieve during the 1970s and 1980s.

30. Investors who finance CLEC expansion apparently have no trouble understanding the potential growth that CLECs have in the current regulatory environment. In the two years subsequent to passage of the 1996 Telecommunications Act, CLECs have secured \$14 billion in capital to finance their facilities expansion. By way of comparison, in the four years prior to the Act, CLECs raised only \$2.4 billion in capital.²³

31. According to a survey conducted by the *State Telecommunications Regulation Report*, approximately 2,100 local exchange interconnection agreements have been reached since passage of the Act.²⁴ The Salomon Smith Barney report also estimates that, given the net lines added by CLECs in the first quarter of 1998, the annualized market share of the CLECs as a group is already 4 percent. With that share increasing 50-100 basis points per quarter, the CLECs are expected to have 7-8 percent market share at the end of 1998 and up to 10 percent

²¹ "CLECs Surpass Bells in Net Business Line Additions for First Time (I/II)," Salomon Smith Barney (J.V. Grubman), May 6, 1998.

²² According to this report, the actual growth rate of RBOC business line net additions has been trending downwards in every quarter since the first quarter of 1997.

²³ *Telecommunications Reports*, "CLECs Tell FCC of Success In Entering Local Markets," February, 2, 1998.

²⁴ "Number of CLECs in U.S. Now Exceeds Total of Incumbent Telcos," *State Telephone Regulation Report*, Vol. 16, No. 19, September 18, 1998.

by end-1999. This appears to agree with the Yankee Group prediction that CLECs will accrue over 11 percent of local revenues by 2000. Overall, these industry reports/analyses clearly demonstrate how quickly local market revenue share erosion is occurring thanks to the inroads that CLECs, including small carriers, are making in the business segment of the local market.²⁵

2. CLEC and CAP facilities provide an alternative to ILEC access.

32. Another measure of alternatives to ILEC provided access is the rapid growth of CLEC and CAP facilities. CLEC network facilities more than doubled from 1996 to 1997; CAP network facilities grew almost 40 percent. The CLEC industry installed 41,103 route miles of fiber transmission facilities between 1996 and 1997—a 110 percent increase over this period—bringing the overall number of route miles to 78,506.²⁶ At the end of 1997, CAPs had deployed more than 1.8 million fiber miles.

Table 1: Fiber Miles Deployed, RBOCs and CAPs.

Year	RBOCs (000)	CAPs (000)	RBOC (% Growth)	CAPs (% Growth)	CAPs (% Growth) / RBOCs (% Growth)
1985	497				
1986	881		77		
1987	1192		35		
1988	1588		33		
1989	2037		28		
1990	2780	55	36		
1991	3882	82	40	49	1.24
1992	5210	123	34	50	1.46
1993	6649	231	28	88	3.18
1994	7965	396	20	71	3.61
1995	9414	643	18	62	3.43
1996	10837	1313	15	104	6.89
1997	12219	1826	13	39	3.06

Source: FCC, Fiber Deployment Update, End of Year 1997

²⁵ These trends also confirm that CLECs have decided to target the higher-margin business segment first, and will likely remain there until (i) universal service reform removes the contribution to implicit subsidies from business local rates, and (ii) the balance between incentives to compete in the two segments starts to shift in the direction of the residential segment.

²⁶ New Paradigm Resources Group, Inc., *1998 Annual Report on Local Telecommunications Competition*.

33. What is more important is the difference in fiber growth rates between RBOCs and CAPs: by the end of 1996, the CAPs' percentage growth was almost seven times that of the RBOCs, and although it has decreased since then, it was still more than three times that of the RBOCs by the end of 1997.

34. The CLEC industry's ability to avoid ILEC access rates is also evidenced by the considerable growth in the number of voice and data switches it has deployed. Between 1996 and 1997 CLECs have deployed 329 voice switches and 331 data switches. There are also plans to install 218 more voice switches. Over the same time period, there has been a 116 percent increase in the number of buildings connected by CLEC networks—from 27,974 in 1996 to 60,401 in 1997. In 1997, CLECs served 1.8 million access lines.²⁷

3. Other technological alternatives.

35. Finally, a complete picture of local competition cannot fully emerge until the role of technology has also been examined. Just as financial incentives (driven by the existing structure and levels of rates) shape CLEC business and competition strategy, they also generate opportunities for alternative technologies to emerge. Often, those alternative technologies can become a critical component of the overall competitive strategy. In recent years, for example, the wireless local loop has emerged as a possible answer to ILEC control of access to residential customers through wireline loops. Being able to bypass the wireline loop affords a CLEC the opportunity to offer the full range of telecommunications services to customers and to avoid the more complicated and contentious interconnection route. AT&T has already conducted market trials using the wireless local loop (as have some other carriers) and the possibility of competition over such loops certainly looms large over the residential segment of the local exchange market.²⁸ Along the same lines, new interest in cable-based competition for

²⁷ *Ibid.*

²⁸ This trend was recently documented in Jason Meyers, "Conspiracy Theory," *Telephony*, November 10, 1997. Evidence of the inroads made by wireless telephony was recently found in Louisiana in a survey conducted by Southern Media and Opinion Research. According to this survey conducted in April 1998, more than 15
(continued...)

local exchange services has emerged from AT&T's proposed purchase of TCI and from the rapid convergence of cable, broadband data and Internet access technologies.

36. Similarly, Personal Communications Service ("PCS") is now emerging as one of the fastest growing alternatives to wireline telephony. Originally intended to compete with analog cellular phone services, PCS is a digital hybrid of the best features of cellular telephony (mobility and portability) and wireline telephony (reliable connections and good sound quality). Several PCS providers have emerged on the national scene, with AT&T Wireless, Inc. and Sprint PCS, Inc. trying most aggressively to develop national footprints. In the process, PCS pricing plans have become dramatically cheaper within the last couple of years, with some prices resembling those typically associated with wireline telephony. For example, AT&T Wireless, Inc. has recently launched its Digital One Rate Plan which offers local and long distance calling anywhere within the U.S. at a single low rate (as low as 11¢ per minute when a subscriber signs up for 1400 minutes of use in a month).²⁹ Taking note of this development, the FCC has agreed recently, in principle, that PCS can be a viable substitute for wireline local and long distance telephony (rather than simply a complement as it was originally thought to be).³⁰ The most interesting feature of this development is that, because of such pricing, PCS is already a feasible alternative for residential customers, particularly those with low to medium usage volumes.³¹ Therefore, PCS-led residential local competition is already becoming a reality.

(...continued)

percent of consumers in Louisiana were using wireless phones as substitutes for wireline phones, and 33 percent of consumers were calling more from wireless phones than from wireline phones.

²⁹ See <http://www.attws.com> for details. Also, see Robert G. Docters, "The New Wholesalers," *Telephony*, January 26, 1998, and a news report by Nancy Gohring, "AT&T to Shift Landline to Wireless," *Telephony*, May 11, 1998.

³⁰ FCC, *In the Matter of: Application by BellSouth Corporation, et al. Pursuant to Section 271 of the Communications Act of 1934, As Amended, To Provide In-Region, InterLATA Services in Louisiana*, CC Docket No. 97-231, Memorandum Opinion and Order, adopted February 3, 1998. See especially ¶¶ 72-73.

³¹ This may appear counter-intuitive at first, but there is a simple reason for it. Many ILECs already have in place flat-rated services that offer residential customers unlimited local and/or intraLATA toll calling, sometimes along with the full complement of vertical services. A typical PCS plan meters all calls at a constant per-minute rate once a subscriber has exhausted the number of "included" minutes purchased for a fixed monthly access (continued...)

E. Assuming X was chosen correctly, implementing a lower price than the one brought about by price caps creates economic inefficiencies.

37. The X-factor in a price cap plan reflects the ability of the regulated firm to reduce its unit costs more rapidly than other firms in the economy. In that way, the price cap derived from the X-factor replicates the pricing discipline that competitive markets impose on competitors. Reducing prices artificially by regulatory prescription in a price cap plan has two effects on economic efficiency. First, such a reduction effectively nullifies the implicit price cap contract that exposes the regulated firm to the financial consequences of market outcomes. Incentives to reduce costs, expand demand and invest in new technology revert to their level under rate of return regulation. Second, prescriptive price reductions within a price cap plan have the effect of choosing an X-factor that is too high. The resulting economic harm is that an efficient regulated firm would be unable to achieve the productivity growth required so that its unit costs would fall to meet its new price. Over time, price reductions would outstrip unit cost reductions, and price levels would increasingly deviate from economic cost, leading to unnecessary reductions in allocative economic efficiency. All else equal, prescriptive access rate reductions would discourage investment by the regulated firm as well as entry by potential competitors.

38. Reducing carrier access prices would provide a disincentive for competitors to enter local exchange and exchange access markets. As the LEC's prices are reduced, there is less potential return for a carrier that builds competing facilities. If pricing carrier access at TELRIC levels were a serious possibility, CAPs or CLECs having lower forward-looking incremental costs than the incumbent LEC would nonetheless be reluctant to enter the carrier access market and

(...continued)

fee. Therefore, for high-volume customers (whose calling exceeds the call allowance), the total monthly cost can increase with volume, while under the flat-rated wireline plans that cost stays fixed. Low-volume customers, on the other hand, may select a PCS plan with a low access fee that provides enough of a call allowance to cover their calling needs and benefit from a total monthly cost that is below those of comparable wireline plans. In PCS' favor are also some other features: (i) a customer can call both local and more distant areas (typically well beyond intraLATA toll zones) all at the same per-minute rate; (ii) PCS telephones are lightweight, portable, and have very good sound quality; and (iii) PCS provides several optional features and are frequently dual mode or capable of receiving data.

face the possibility of competing against prescriptive prices set below any efficient firm's true economic costs. Prescriptive access charge reductions provide poor signals to potential entrants because such prices do not reflect their full economic costs. In addition, competitive entry is distorted by regulatory artifacts such as the averaging of prices across urban and rural areas. Sufficient pricing flexibility to adapt access pricing structures to customers' preferences would increase economic welfare and foster efficient competition far more than an across-the-board non-economic access charge reductions imposed by prescriptive regulatory fiat.

39. Finally, it is worth recalling that consumers only benefit from access charge reductions if long distance carriers pass through those reductions in the form of lower prices. As the Commission has noted recently,³² there is substantial evidence to indicate that such price reductions, if passed through at all, are not being passed through completely or to all customers.³³ Consequently, the potential welfare gains from prescriptive reductions in access charges trumpeted by the IXC's are overstated.

F. The direction charted by the FCC is correct and should be sustained

37. The direction set by the *Access Reform Order* reflects a host of correct and enlightened choices by the FCC:

1. The FCC acknowledges that access and universal service reform must proceed apace and that both must be coordinated with its current price cap regulation of the major ILECs.
2. The FCC is willing to delay the outcomes that MCI and other IXC's desire so much—reduction of access charges to economic cost—in order to get the sequence of events right. Any prescription of access rates to cost immediately would only upset the finely

³² FCC Chairman William E. Kennard recently referred to "the growing body of evidence that suggests that the nation's largest long distance companies are raising rates when their costs of providing service are decreasing.," letter to Bert Roberts, CEO of MCI (February 26, 1998).

³³ Recent evidence based on a survey of residential long distance bills shows that the changes in level and structure of access charges in early 1998 were not passed through in the form of lower average revenue per minute charged to residential customers. See P.S. Brandon and W.E. Taylor, *op. cit.*

tuned access and universal service reform process, hurt ILECs economically, and create unnecessary rate shock.

3. The FCC recognizes the value of price cap regulation in being able to both bring down access charges over time and induce ILECs to become more efficient and productive.
4. The FCC also recognizes the value of not abusing price cap regulation through unjustified imposition of unwarranted policy-based X-factors or preventing the ILECs from earning, by dint of their efforts to become more efficient, returns in excess of 11.25 percent.

No unanticipated events have transpired in the past year, and these choices remain just as valid today.

40. The FCC's faith in market mechanisms is more than doctrinaire; as competition comes to telecommunications markets, microregulation will become increasingly unworkable. Market mechanisms are far better at "revealing" costs and "choosing" technologies than a regulatory agency that may not have all the information it needs. Also, reliance on market mechanisms reduces the probability and frequency of costly litigation and regulatory delays. Having adopted such a path, any radical change of direction midstream, *e.g.*, a return to more prescriptive regulation, would generate business risk and uncertainty and adversely affect the competitive momentum that the FCC so desires to build. By staying true to the vision articulated in its Access Reform and Universal Service Orders,³⁴ the FCC will ensure that change will come to telecommunications, particularly in the markets for local exchange and exchange access services, but at a pace and in a sequence that promotes the sometimes conflicting interests of all competitors, not just of a select few.

III. CHANGES TO THE PRODUCTIVITY OFFSET

41. In May 1997, the Commission adopted a permanent price cap plan with a productivity offset of 6.5 percent, modifying the value of the X-factor in its plan for the second time in

³⁴ *Access Reform Order and In the Matter of Federal-State Joint Board on Universal Service*, FCC 97-157, Report and Order, CC Docket No. 96-45, adopted May 7, 1997.

seven years. While the theory of price cap regulation requires that the productivity offset be treated as a fixed target, fine-tuning and frequent reviews emphasizing accounting earnings will foster a connection between measured costs and the price cap index which would threaten the incentive structure of the Plan. As the Commission observed (essentially twice) in the Fourth Report and Order:

We plan to focus in our next performance review on ensuring, to the extent possible, that we do not substantially undermine each price cap incumbent LEC's incentives to improve its efficiency. For instance, we would plan to make adjustments based on demonstrated industry-wide performance or other generic factors, rather than adjustments that are tied to a particular price cap incumbent LEC's interstate earnings.³⁵

It is important that the Commission keep these plans in mind as parties update and refresh their arguments concerning possible changes to the industry value for X.

A. The productivity offset has performed as anticipated.

42. The initial purpose of shifting to a price cap regulatory regime was to improve the incentive effects of rate-of-return regulation and to begin a transition toward a regulatory system that was compatible with competition. As customers find alternatives to ILEC carrier access services, competitive forces should replace regulatory forces in controlling prices. During this transition, price cap regulation should be as competitively neutral as possible, neither advantaging nor disadvantaging regulated firms in competition with incumbents, and for those services and geographic areas where actual and potential competition disciplines the market price, price cap regulation is intended to transition away. In this evolving regulatory plan, the productivity offset, X, is designed to ensure that—on average—the LECs' access prices fall at approximately the rate at which the unit costs of an efficient LEC can be expected to fall.

43. As shown above, price cap regulation has reduced access charges in general, and per-minute switched access prices in particular, at an impressive rate. Such performance is all the more

³⁵ Fourth Report and Order, ¶¶ 167 and 180.

remarkable because a large component of access charges explicitly does not represent recovery of the cost of carrier access services but rather a contribution flow to offset costs of basic exchange service. Reduction or removal of this component of access charges is not intended to take place through higher LEC productivity gains but rather by shifting cost recovery through the Commission's universal service fund. In addition, these price reductions took place during a period in which the ILECs incurred increased investment and operating expenses to implement the network rearrangements and unbundling required by the Act. In sum, the performance of the productivity offset in the LEC price cap plan has met expectations, and there is no compelling reason to abandon the market-based approach on productivity grounds.

B. Updates of the FCC's method for calculating X produce lower results.

44. In its *Fourth Report and Order*, the Commission took X to be a short-term (1986-1995) average of the sum of annual total factor productivity growth for the LEC industry and the difference between the annual input price growth rates for the industry and the U.S. economy. Using publicly available data, the Commission determined a likely range of X values from 5.2 to 6.3 percent and selected 6.0 because of an upward trend in measured X towards the end of the period. To that value of the historically-achieved X, the Commission then added a consumer productivity dividend ("CPD") of 0.5 percent "to ensure that increased benefits from the increased productivity we expect from incumbent LECs flow through to price cap customers."³⁶ The permanent value of X was thus set at 6.5 percent, and the current *Public Notice* invites parties to update that record.

45. When the method used to set X in the *Fourth Report and Order* is updated, 1996 and 1997 values of X are lower than the X values calculated for earlier years, and averages of X over recent periods are lower than those used by the FCC to support its historical estimate of 6.0

³⁶ *Fourth Report and Order*, ¶¶ 137-141.

percent.³⁷ Thus, if a change were to be made to the target value of X based on the FCC's method and updated numbers, it would have to be reduced: the average historical value of X would be lower and, as discussed below, the CPD of 0.5 percent would no longer be applicable.

C. Changes in the access charge structure make an historical industry productivity target more difficult to achieve.

46. It is a mathematical fact that reducing the margin from high-growth services—while increasing margins on low-growth services—necessarily reduces both measured productivity growth and the ability of the firm to maintain earnings while reducing the overall level of prices. Under the Commission's new access charge structure, which recovers more costs from access line-related services and fewer costs from usage-based services, historical productivity targets will be more difficult to attain. Offsetting this effect, as the Commission observed in the Fourth Further Notice (§§ 128-129), is the stimulation effect on the demand for carrier access services stemming from lower access charges and lower toll rates. However, two features of the access and toll markets mitigate this effect.

47. First, unless access charge reductions are passed through to long distance customers, there will be little stimulation in the demand for access services. The market demand for switched access service is derived from the demand for long distance service, so unless access price reductions result in toll price reductions, there will be little demand stimulation from an access price reduction.³⁸ Second, even if access charge reductions are passed through in lower long distance rates, the toll demand stimulation will be small in relation to the access charge reduction. Because access costs amount to about 40 percent of the cost of toll, a 10 percent reduction in the price of switched access—if fully passed through—would amount to only about a 4 percent reduction in toll prices. A reduction in access prices will certainly cause

³⁷ Frank M. Gollop, "Replication and Update of the X-Factor Constructed under FCC Rules," Attachment E to the "Comments of the United States Telephone Association," CC Docket Nos. 96-262, 94-1, 97-250 and RM-9210, October 26, 1998.

³⁸ As competitors enter the access market and as IXC's engage in self-supply of access, the price elasticity facing individual firms will become larger.

access revenue to fall and will stimulate only a modest increase in usage. Moreover, in the future, as access prices fall relative to toll prices, the share of access costs in toll revenue will fall, and the price elasticity of the market demand for access will consequently fall as well.

48. The Fourth Report and Order gives two reasons why the Commission expects the price cap LECs to be able to meet the target productivity offset of 6.5 percent, despite the fact that 6.5 percent exceeds the Commission's estimate of the historical X the industry has been able to achieve. First, under historical price cap regulation with sharing, LECs may not have reduced prices as much as they reduced their costs, and because lower prices would have led to demand stimulation, higher output growth and the realization of additional scale economies, historical productivity growth underestimates achievable productivity growth under improved regulation. Second, the Commission expects the access price reductions in its *Access Reform Order* to "greatly stimulate usage" which, in turn, it expects "to lead to more efficient use of the LEC network."³⁹

49. The problem with both of these arguments is that they depend on demand stimulation from reduced switched access charges. To the extent that access charge reductions are not passed through in lower toll rates, additional stimulation will not occur, and additional productivity growth will not be readily forthcoming. We recently examined the effects of the access price reductions in the FCC's *Access Reform Order* on residential long distance prices, using a statistically valid sample of customer bills.⁴⁰ Despite the January 1998 reductions in access charges, average revenue per minute for residential long distance customers increased, so that the Commission's expectation that its *Access Reform Order* would "greatly stimulate usage" will not be realized, and the productivity growth stemming from that stimulation will also not occur.

³⁹ Fourth Report and Order, ¶ 142.

⁴⁰ See P.S. Brandon and W.E. Taylor, *op. cit.*

D. The consumer productivity dividend is no longer relevant.

50. At the beginning of price cap regulation, the role of the CPD was to ensure that consumers would receive a reasonable share of the increased productivity growth realized by the movement from traditional rate of return regulation to price cap regulation.

Price cap regulation is also intended to generate incentives and opportunities for LECs to achieve still higher productivity growth. In the LEC Price Cap Order, we mandated a price cap index that includes at least a 3.3 percent productivity offset each year, based on two Commission staff studies which, when averaged, indicated a historical productivity growth of 2.8 percent, and a consumer productivity dividend (CPD) of 0.5 percent. [fn: LEC Price Cap Order, 5 FCC Rcd at 6796. A short-term study examined productivity trends in interstate access from 1984 to 1990, and a long-term study covered interstate charges generally for the years 1930 to 1989. The 0.5 percent CPD was then added to assign the first price cap productivity gains to customers in the form of lower rates.]⁴¹

In addition, since the CPD remains as a component of the X-factor year after year, the Commission must believe that more efficient regulation makes possible a permanent increase in achievable annual productivity growth, not merely a one-time change in productivity.

51. In the Fourth Report and Order, historical productivity growth for the LEC industry is measured over the 1986-1995 period; using currently available data, updated historical productivity growth is measured over the 1986-1997 period. The Commission's preferred point estimate of the historical X was taken from averages of more recent periods and adjusted to account for an increasing trend at the most recent end of the period. A heavy weight in this calculation is given to short-term, recent experience. That experience is largely taken from periods under price cap regulation, and it also includes the effect on productivity growth of moving from rate of return to price cap regulation and from price cap regulation with sharing to what the Commission characterizes as "pure" price cap regulation. As no shift to a more

⁴¹ *In the Matter of Price Cap Performance Review for Local Exchange Carriers*, First Report and Order, CC Docket No. 94-1, released April 7, 1995, ¶ 99.

efficient form of regulation is contemplated in the *Public Notice*, there is no additional productivity growth from regulatory reform to share with consumers.

IV. PRICING FLEXIBILITY FOR CARRIER ACCESS SERVICES

52. Assessment of the Commission's market-based approach to access charge reform requires some experience with competition under pricing flexibility both to judge its effectiveness and to prescribe—if necessary—changes to the plan. As the Commission observed in its *Access Reform Order*:

[I]t would be imprudent to prejudge the effectiveness of those measures at creating competitive local markets. Rather than ignore or interfere with the effects of this developing competition on prices for interstate access services, we find that the public interest is best served by permitting emerging competition to affect access charge rate levels. In addition, the experience we gain from observing the effects of emerging competition on interstate access services will permit us more effectively and efficiently to implement any prescriptive measures that may be needed in the future to ensure that interstate access services remaining subject to regulation are priced in accordance with the forward-looking economic cost of providing those services.

Economic logic holds that giving incumbent LECs increased pricing flexibility will permit them to respond to competitive entry, which will allow prices to move in a way that they would not have moved were the pricing restrictions maintained. This can lead to better operating markets and produce more efficient outcomes. Deregulation before competition has established itself, however, can expose consumers to the unfettered exercise of monopoly power and, in some cases, even stifle the development of competition, leaving a monopolistic environment that adversely affects the interests of consumers. Therefore, it is important that we design our market-based approach carefully. We must, among other things, decide which, if any, of the rules setting forth specific competitive triggers and corresponding flexibility as proposed in the NPRM we should adopt. We will resolve these issues in the subsequent report and order in this docket. [¶¶ 269-270]

The industry still awaits that pricing flexibility decision, and, to date, we have had no experience with competition for access services under pricing flexibility. Since significant pricing flexibility has not been permitted for switched access services, there is little evidence

that is useful for measuring the effects of competition on unregulated (or less regulated) access prices.

53. The *Public Notice* calls attention to two specific pricing flexibility proposals on the record that request phased relief and criteria to evaluate the degree of competition that vary by service. The *Access Reform Order* observes that:

A market-based approach will permit and, indeed, require us progressively to deregulate the access charge regime as competition develops. In a subsequent order, we will examine specific issues concerning the timing and degrees of pricing flexibility. That order will identify the competitive triggers that must be met to justify relaxation of specific regulatory constraints [¶ 49]

In previous reports filed with the Commission over the past four years, Richard Schmalensee and I have pointed out the need for pricing flexibility for access services as access markets are opened to competition, and some of our ideas—particularly regarding triggers—have evidently resonated with the economic thinking at the Commission.⁴² In our work, we have identified several simple pricing flexibility principles that should guide the Commission in its efforts:

1. Market forces are vastly superior than reliance on regulation to determine efficient levels of output, investment and price, and the Commission should primarily rely on them. Imperfect competition generally beats imperfect regulation.
2. It is essential to reduce unnecessary asymmetric obligations when the market is *first* fully opened to competitors—*i.e.*, even when the incumbent firm retains too much market power to allow deregulation.
3. The Commission should pursue a policy that rewards efficiency, not one that protects particular competitors.

⁴² Richard Schmalensee and William Taylor: "Comments on the USTA Pricing Flexibility Proposal," filed as Attachment 4 to the United States Telephone Association Comments, CC Docket 94-1, May 9, 1994; "Reply Comments: Market Analysis and Pricing Flexibility for Interstate Access Services," filed as Attachment 3 to the United States Telephone Association Reply Comments, June 29, 1994; "Economic Aspects of Access Reform," CC Docket No. 96-262 et. al., filed on January 29, 1997, rebuttal filed on February 14, 1997; "The Need for Carrier Access Pricing Flexibility in Light of Recent Marketplace Developments: A Primer," *ex parte*, CC Docket No. 96-262 et. al., filed on January 21, 1998.

4. Prices must be permitted the freedom to reflect differences in costs and conditions in specific markets.

54. In addition, our work and experience in classifying and deregulating telecommunications services has emphasized one essential piece of practical wisdom. Competitive triggers that require measurement of the degree of competition in particular markets are unsatisfactory because the degree of competition cannot be measured sufficiently accurately and unambiguously. If a full-scale market power study must be performed for every service and geographic market in which pricing flexibility is requested to meet competitive threats, the process will be unsatisfactory. Decisions will be too slow and too unpredictable, and consumers will not benefit from the additional competition that incumbent regulated firms can bring to the market. Rather, the events that trigger progressive deregulation of services must be unambiguous and observable even at the risk of imperfectly detecting the presence or absence of residual market power.

55. Over the years, the incumbent LECs have jointly and individually made pricing flexibility proposals along these lines to the Commission. The industry pricing flexibility plan submitted by USTA in this proceeding is consistent with these economic principles. First, the markets in question are measured in practical correspondence to economic geographic and service markets. Geographically, application would be made for individual MSAs, groups of contiguous MSAs or a LATA. Services distinguish between transport and switched access with the latter subdivided between services for residential and single line business and multi-line business customers. Within this market structure, progressively stringent competitive events trigger progressively greater degrees of pricing flexibility in three phases.

56. Classification in Phase 1 recognizes the presence of competition in a market area but implies no presumption that competitive forces are adequate to prevent exercise of market power or anticompetitive pricing. The trigger for this phase is the approval of an interconnection agreement or Statement of Generally Available Terms for interconnection combined with the presence of competitors having customers actually using alternative transport or switched access services. Flexibility in Phase 1 generally removes the important

regulatory impediments an ILEC faces in attempting to match competitors' service offerings and prices, including streamlined new services regulation, price deaveraging and increased ability to offer volume and term pricing, individual contracts and promotional pricing. Because the services remain under price caps, this added flexibility cannot be used to exercise market power.

57. While the presence of competition in a market area does not necessarily imply that any particular competitor may succeed or that competitors in general will ever supply a significant fraction of demand. What this event does signal is the start of competition, and it is when competition starts—not when competitors succeed—that the incumbent firm must be permitted to adjust its prices and products to the new environment. Otherwise, the success or failure of the observed entry will be affected by the asymmetric regulation of the incumbent, the competitive process will be distorted and consumers will not necessarily be served by the most efficient supplier. Note that the trigger for Phase 1—approved interconnection arrangements and the presence of competitors with customers—is observable and unambiguous. A regulator need not hold contentious evidentiary hearings to determine if this condition is met, and—in stark contrast to market power-based standards—neither the entrant nor the incumbent LEC need second-guess the regulator's opinion of the evidence as to whether the competitive glass is half empty or half full.

58. Phases 2 and 3 progressively remove the remaining constraints on ILEC pricing imposed by the price cap structure. In Phase 2, the basket structure is simplified, the low-end adjustment mechanism is removed, and the productivity offset is set at inflation, effectively relying on competitive forces to pass through productivity gains in excess of the U.S. economy-wide average. Phase 3 removes services from price cap regulation entirely and thus requires confidence that market forces constrain the ability of the regulated firm to exercise market power. While Phase 2 retains a price cap, it still relies on market forces to pass through productivity gains in excess of the national average to access customers.

59. Triggers for classification of services as Phase 2 and 3 are increasingly stringent degrees of addressability: for Phase 2 relief, 25 percent of the ILEC's demand in the area must be

addressable through collocation arrangements, UNEs or alternative facilities, and classification as Phase 3 requires 75 percent addressability. In both cases, customers must actually be using the qualifying facilities.

60. Addressability is a reasonable trigger mechanism because it is observable, not manipulatable, and closely related to capacity which is frequently the preferred metric of market share used in evaluating market power in telecommunications markets.⁴³ Carrier access services are generally provisioned on high-capacity optical fiber networks whose physical capacity is essentially unlimited but whose ability to serve customers may be geographically constrained. The fact that a competitor's fiber ring in the financial district has spare capacity may not necessarily put direct competitive pressure on access services sold in an office park in the suburbs. However, once a carrier collocates or purchases UNEs in a wire center, it can reach all customers in that wire center with little expenditure of sunk costs. Hence, the fraction of addressable demand in the market is a reasonable measure of the ability of competitors to expand demand to render the exercise of market power unprofitable to the regulated firm. While there are no bright lines in economic theory to identify whether 25 percent or 75 percent addressability would render unprofitable a small but significant permanent price increase, our previous work suggests that a 25 percent addressability standard—then based entirely on facilities-based competition without collocation or UNEs—would correspond to a structural measure of sufficient competitive pressure that price cap regulation would no longer be required to constrain prices.⁴⁴ If that perception was reasonably accurate four years ago, the more stringent proposal today, coupled with the procompetitive initiatives in the Telecommunications Act and the Local Competition Order, will be sufficient to flow-through productivity gains in excess of the national average to customers of Phase 2 services and protect customers of Phase 3 services from the exercise of market power.

⁴³ *In the Matter of Motion of AT&T Corp. to be Reclassified as a Non-Dominant Carrier*, FCC 95-427, Order, released October 23, 1995.

⁴⁴ Richard Schmalensee and William Taylor: "Comments on the USTA Pricing Flexibility Proposal," filed as Attachment 4 to the United States Telephone Association, Comments, CC Docket 94-1, May 9, 1994, pp. 32-39.

V. CONCLUSIONS—THE ROLE OF THE UNIVERSAL SERVICE FUND

61. Like Sherlock Holmes' dog that failed to bark, the key element in the *Public Notice*—the Universal Service Fund—is conspicuous by its absence. There are many moving parts in the reform of carrier access charges: changes in rate structure to align cost recovery with cost causation, possible adjustments to the target rate of productivity growth, changes in the competitive landscape from provision of unbundled network elements and resale and, finally, shifts in the remaining implicit subsidies supporting universal service. In this regulatory stew, the level and structure of the Universal Service Fund and the relationship between the federal and state universal service funds is a critical ingredient of any access charge reform proposal.

62. Carrier access charges have been set explicitly to provide contribution towards subsidized basic local exchange services, stemming from the “Pure 1” and “Pure 2” debates in Docket 78-72 over two decades ago. That subsidy support is “implicit,” *i.e.*, it is neither readily visible nor quantifiable. From an economic standpoint, any such contribution forces price above the underlying economic cost and generates economic efficiency losses. ILECs—the providers of access—lose whenever uneconomic bypass of switched access occurs simply because the price of access is prevented by universal service support from coming closer to the true economic cost of access. IXCs—the users of access—and their customers lose to the extent that the universal service support in access charges inflates long distance rates and, therefore, suppresses demand for long distance service.

63. Reductions in carrier access charges, offset by increases in basic local exchange rates are generally acknowledged to move the rate structure in a direction that greatly increases economic efficiency and—under the assumption that access charge reductions flow through to lower toll rates—has benign or positive effects on the fraction of households that subscribe to telephone services.⁴⁵ Lower toll rates move price towards incremental cost and greatly expand the demand for the service; higher basic exchange rates also move price towards cost but have

⁴⁵ J. Hausman, T. Tardiff and A. Belinfante, “The Effects of the Breakup of AT&T on Telephone Penetration in the United States,” *American Economic Review*, 83(2), May 1993, pp. 178-84.

little effect on the demand for access to the network. This reform was begun in 1985 when flat-rate residential SLCs were introduced, and it continued through 1989 as the SLCs were slowly raised to their current levels. The per-minute access charges paid by IXCs were sharply reduced, and the associated reductions in toll rates—whether or not they fully passed through the reductions in access charges—undeniably stimulated an unprecedented growth in interstate calling. Most proponents of efficient telephone pricing cite this transition and its immense welfare gains as a watershed event in U.S. telecommunications regulation.⁴⁶

64. Somewhat less efficient than this first-best rate rebalancing solution has been the Commission's recent effort to better align cost recovery with cost causation: over time, moving various components of non-traffic sensitive costs away from usage-based recovery towards flat-rate end user charges (SLCs) and flat-rate carrier charges (PICCs) that may ultimately be recovered by the carriers through efficient flat-rate end user charges.⁴⁷ While PICCs are assessed on a flat-rate basis, they are not directly assessed on the cost-causer (i.e., the end user), and not all access providers incur the costs that PICCs recover or are obliged to charge them to their customers. A third solution takes the non-traffic sensitive costs (Carrier Common Line, residual Transport Interconnection Charge and retail marketing expenses) that cannot be recovered in flat-rate charges to the cost-causer (i.e., higher basic exchange rates or SLCs) and recovers them through an assessment on all telecommunications services. In this proposal, support for universal service is competitively neutral since all users of the public switched network pay proportionally to keep basic exchange rates and SLCs at an acceptably low level, but it sacrifices some efficiency by recovering support from more elastically-demanded services.

65. Realizing the inherent linkages among the current system of interstate access charges, the current mode of supporting universal service, and the role of price cap regulation in disciplining

⁴⁶ See, e.g., L.J. Perl and W.E. Taylor "Telephone Penetration and Universal Service in the 1980s," in B. Cole (editor), *Divestiture Five Years Later*, Columbia University Press, New York, 1989.

⁴⁷ *Access Reform Order*, ¶¶ 53-66.

access rates, the FCC has laid out a multi-phase plan of reform which ensures that elements of all three are coordinated as reform goes forward. Breaking a link anywhere in this three-way chain would only end up disrupting the rest of that reform plan. Examples of such breakage would include singling out access rates for prescriptive regulation, or modifying some of the critical parameters of the price cap plan in place, before universal service reform has been completed and all implicit subsidies have been moved out of service prices. Upsetting the balance in such a complicated but essential undertaking may well serve the IXC interests for now, but it will prove injurious to carriers, customers, and the future of telecommunications itself.

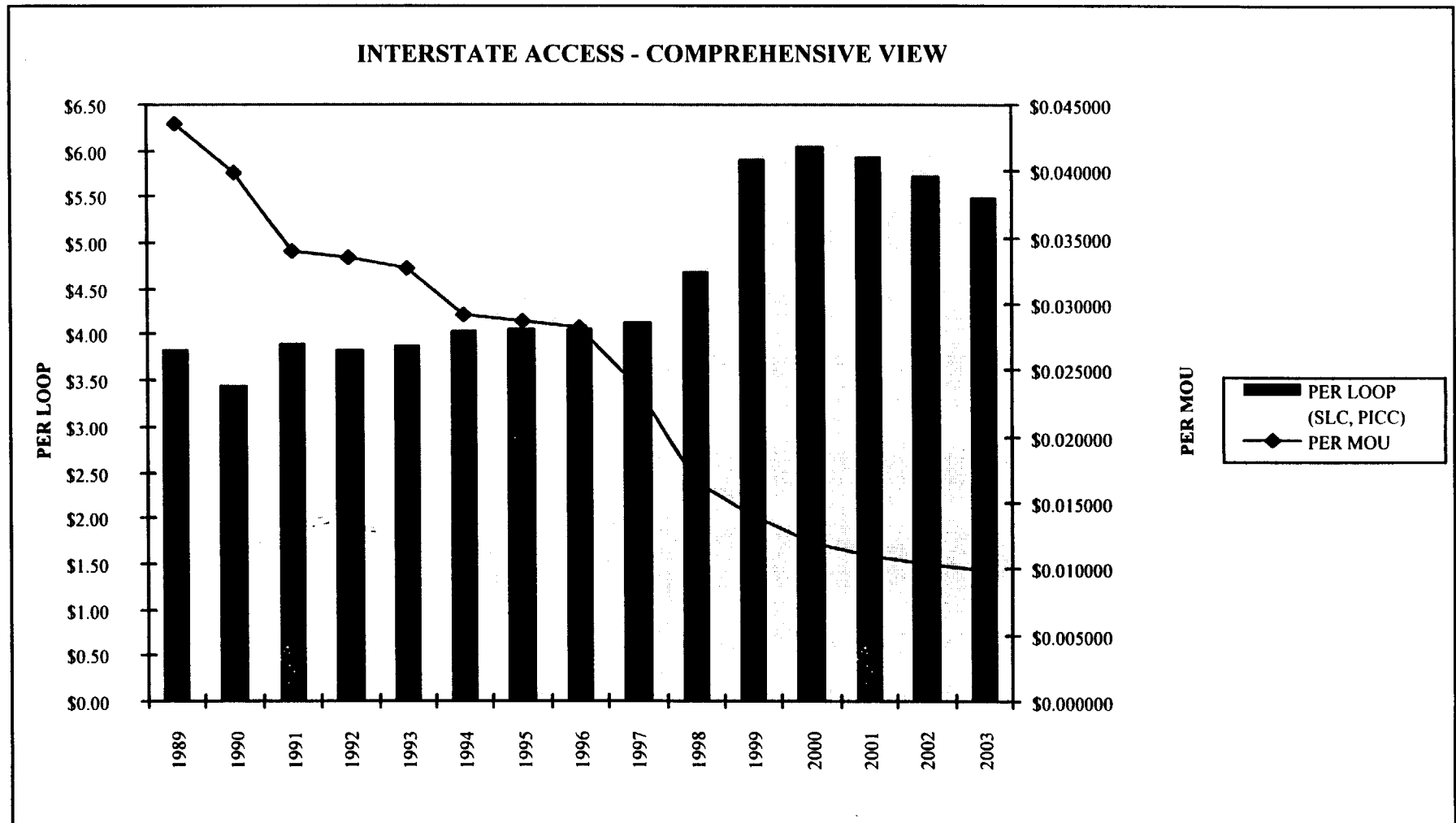
66. Recognizing the adverse economic consequences of internal funding of implicit subsidies, the Act decreed that all support for universal service be made explicit—*i.e.*, de-linked from prices of services like switched access—and raised separately from a universal service fund in which all telecommunications carriers must participate. The FCC, in turn, took note of this connection and spelled out policy directions that clearly recognized the link between reform of the present access charge system and reform of the manner in which universal service is supported.⁴⁸ That is, while the FCC accepted the common view that access charges exceed their costs at least partly because of embedded subsidies for universal service, it also determined that reform of the access charge system cannot proceed on a separate track from reform of the universal service support program. Therefore, any prescriptive move to force ILECs to reduce their interstate access charges to economic cost would not only be premature but also violate the FCC's own policy of coordinated reform of access charges and universal service.

⁴⁸ Access Reform and Universal Service Orders.

ATTACHMENT B

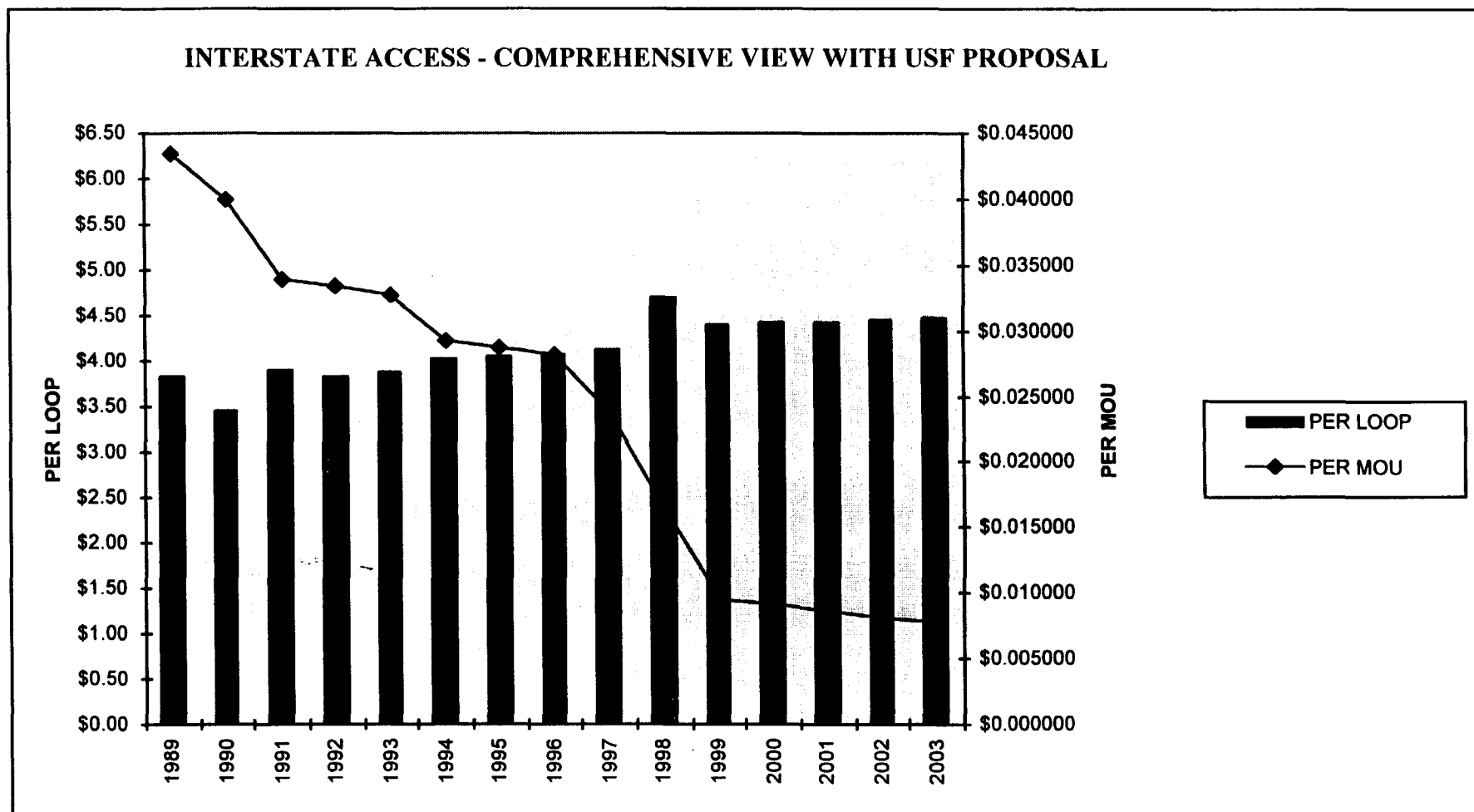
**USTA COMMENTS
CC DOCKET NO. 96-262
OCTOBER 26, 1998**

INTERSTATE SWITCHED ACCESS - TOTAL



CURRENT PLAN RESULTS IN STEADY, CONTINUAL DECLINE IN USAGE CHARGES. LOOP CHARGES (IN AGGREGATE) INCREASE UNTIL 2000 AND BEGIN TO DECLINE.

INTERSTATE SWITCHED ACCESS - TOTAL



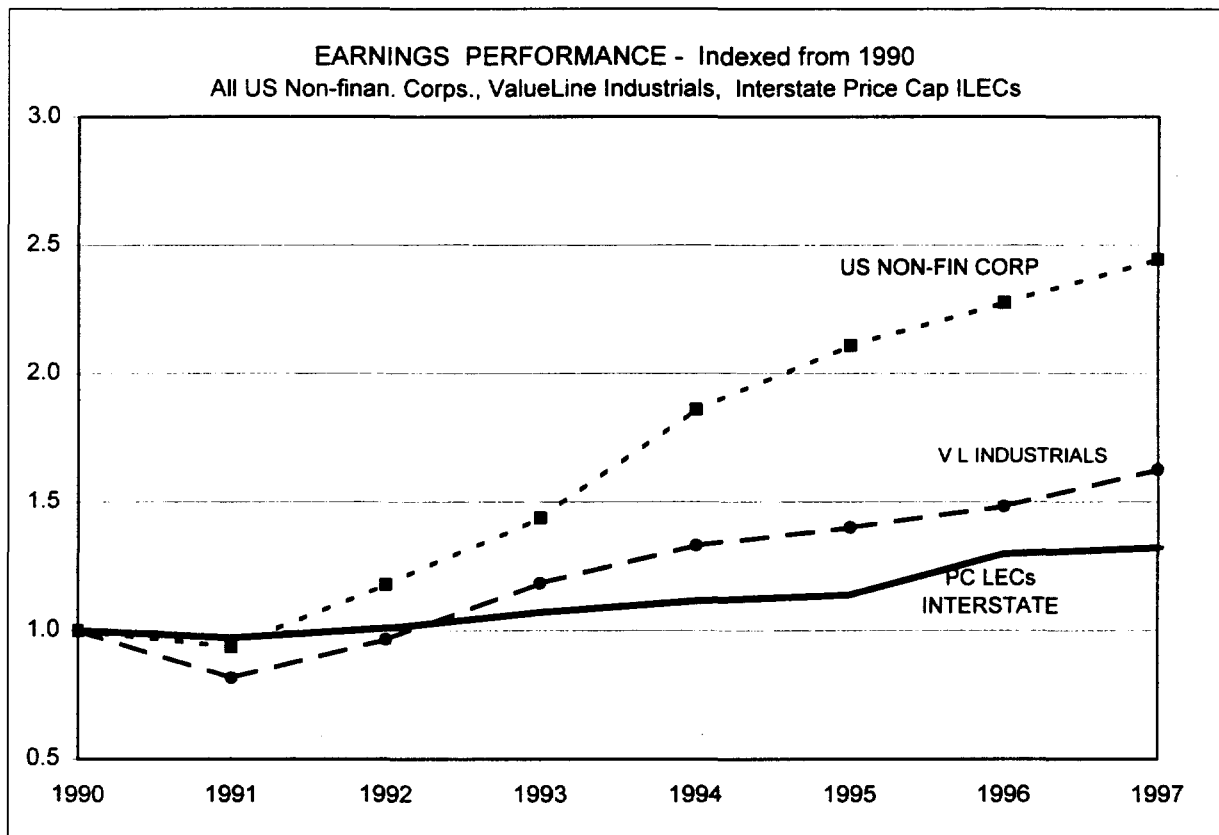
ADOPTION OF THE INDUSTRY PROPOSAL FOR USF WILL IMMEDIATELY DROP THE PER-MOU RATES TO \$.01 PER-MOU. LOOP CHARGES WILL ALSO IMMEDIATELY DECREASE DUE TO ELIMINATION OF THE PICC.

ATTACHMENT C

**USTA COMMENTS
CC DOCKET NO. 96-262
OCTOBER 26, 1998**

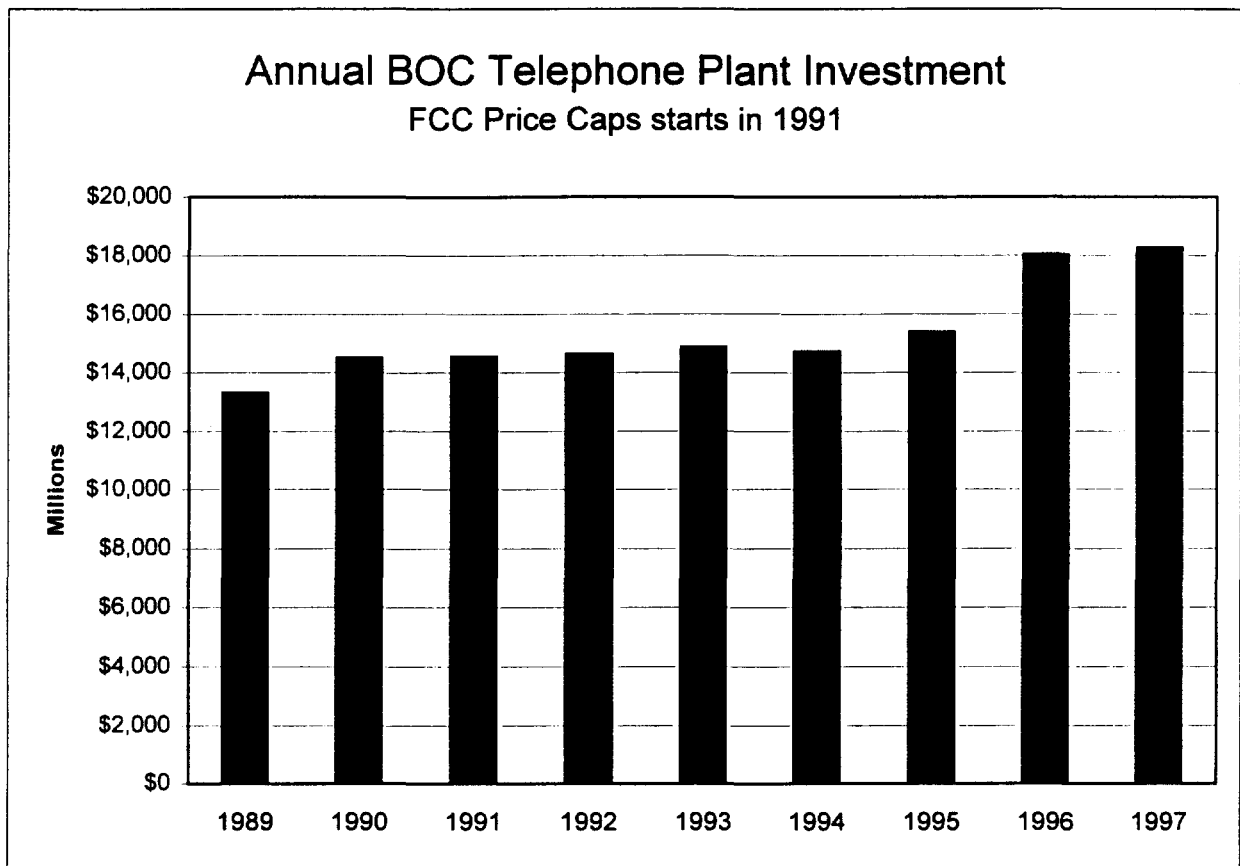
ANNUAL EARNINGS PERFORMANCE
PRICE CAP ILECS, ValueLine Industrial Composite, US Non-Finan. Corps.
\$ MILLIONS

				----- EARNINGS INDEX -----		
	P C ILECS Interstate	All U.S. Non-fin Corps	752 V.L. Industrials	Interstate P C ILECS	All U.S. Non-fin Corps	752 V.L. Industrials
1990	\$3,798	\$141,650	\$113,800	1990	1.000	1.000
1991	\$3,694	\$132,825	\$93,000	1991	0.973	0.817
1992	\$3,832	\$166,725	\$110,000	1992	1.009	0.967
1993	\$4,068	\$203,600	\$134,700	1993	1.071	1.184
1994	\$4,236	\$263,525	\$151,300	1994	1.115	1.330
1995	\$4,324	\$298,900	\$159,400	1995	1.138	1.401
1996	\$4,927	\$322,400	\$168,700	1996	1.297	1.482
1997	\$5,016	\$346,300	\$184,900	1997	1.321	2.445



ANNUAL TELEPHONE INVESTMENT
Telecommunications Plant in Service - Bell Operating ILECs
\$ MILLIONS

1989	\$13,308
1990	\$14,513
1991	\$14,549
1992	\$14,640
1993	\$14,873
1994	\$14,724
1995	\$15,393
1996	\$18,040
1997	\$18,277

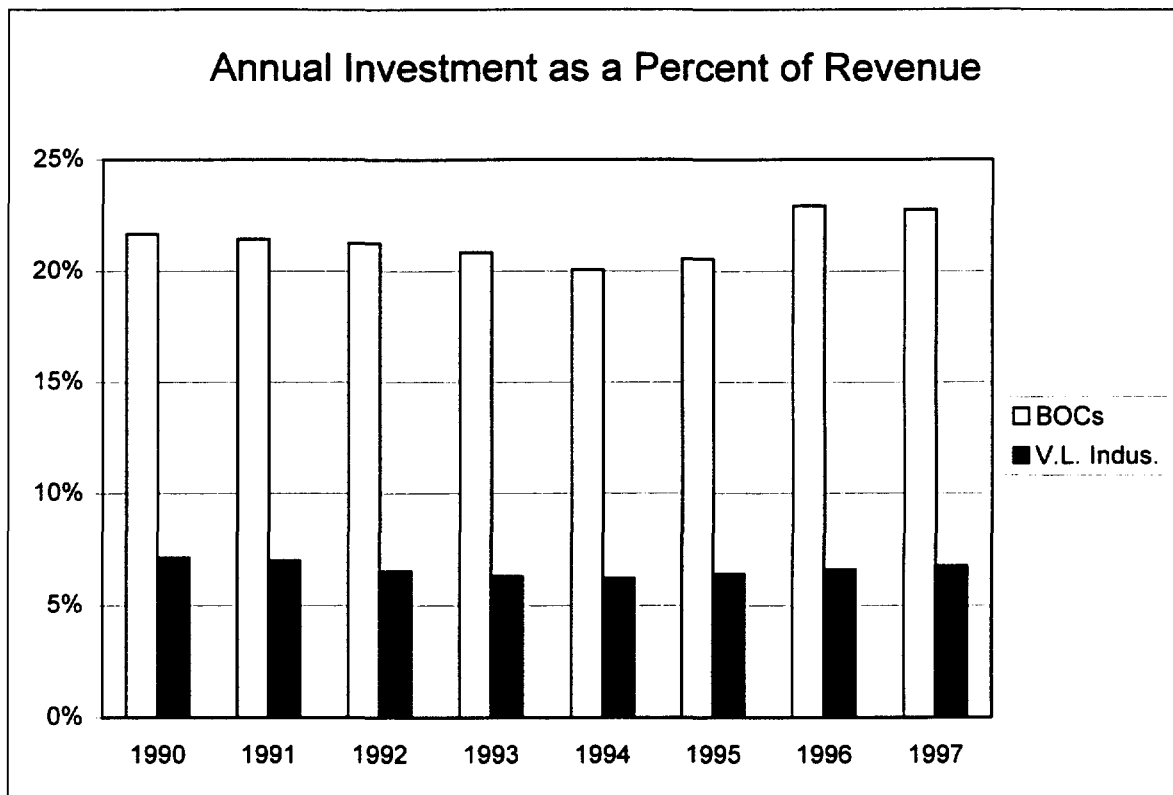


CAPITAL SPENDING AS PERCENT OF REVENUES

BOC Telcos and Value Line Industrials Composite (752 Firms)

[\$ Billions]

		Value Line Industrials					
Bell Operating Companies				Capital	INVESTMENT PERCENT		
Total Revenue	Plant Added	Total Revenue	Spending		BOCs	V.L. Indus.	
1990	\$67.01	\$14.51	\$2,582,119	\$184,590	1990	21.66%	7.15%
1991	\$67.90	\$14.55	\$2,633,278	\$184,734	1991	21.43%	7.02%
1992	\$68.94	\$14.64	\$2,757,865	\$180,245	1992	21.24%	6.54%
1993	\$71.33	\$14.87	\$2,863,300	\$180,500	1993	20.85%	6.30%
1994	\$73.37	\$14.72	\$3,123,100	\$194,500	1994	20.07%	6.23%
1995	\$74.86	\$15.39	\$3,407,600	\$218,500	1995	20.56%	6.41%
1996	\$78.72	\$18.04	\$3,643,100	\$240,600	1996	22.92%	6.60%
1997	\$80.35	\$18.28	\$3,810,300	\$258,500	1997	22.75%	6.78%



ATTACHMENT D

**USTA COMMENTS
CC DOCKET NO. 96-262
OCTOBER 26, 1998**

Attachment D
to Comments of United States Telephone Association

Technical Report:
Replication and Update of the X-Factor
Constructed Under FCC Rules

Prepared by Frank M. Gollop
Professor of Economics
Boston College

October 22, 1998

Executive Summary

This project replicates and updates the X-Factor model adopted by the FCC in its May 1997 order. An EXCEL spreadsheet is developed duplicating the model presented in Appendix D of the Commission's order. No changes are made to the 1985-95 industry data found in the charts in the FCC order. In those instances where the Commission relied on data produced by the Bureau of Labor Statistics (BLS) or the Bureau of Economic Analysis (BEA), revised data were adopted for the 1985-95 period if and only if BLS and/or BEA revised its data series. In no instance was the Commission's methodology altered. The net effect of the BLS and BEA revisions is modest. The average X-Factor for the post price-cap period 1991-95 period decreases from the FCC's May 1997 reported result of 5.2% to a now updated 5.0%.

The FCC model is updated through 1997. The results for 1996 and 1997 are formed from a framework wholly consistent with that applied to the 1985-95 period. The 1996 and 1997 results are derived using the same formulas applied by the Commission to all earlier years. Industry data for the RBOCs in 1996 and 1997 are provided by USTA and are taken from the same sources identified by the Commission for its 1985-95 data; 1996 and 1997 values of variables based on revised U.S. government data are derived from the same updated data as are their earlier counterparts. Six important conclusions follow from the analysis of the updated data.

- The X-Factors for 1996 and 1997 at 2.1% and 4.1%, respectively, are lower than most of the X-Factors calculated for earlier years. The 2.1% factor for 1996 is the lowest X-Factor since 1986. The 4.1% factor for 1997 is lower than seven of the nine X-Factors over the 1987-95 period.
- The 6.7% factor for 1995, following rising X-Factors in 1993 and 1994, had been interpreted by some as evidence of an upward trend that would continue into the future. It now is evident that the 1995 X-Factor was a short term cyclical peak.
- Comparing the trend in X-Factor averages over the five periods analyzed in the FCC order (1987-95,..., 1991-95) with the trend in the seven period averages formed from the updated series (1987-97,...,1993-97) reveals that both trends are negative. This suggests that a longer term downward trend was in place even before the 1996/97 update.

- Each entry in the latter trend is approximately 0.5 percentage points below its corresponding average ending in 1995.
- No matter which subperiod is selected, no X-Factor exceeds the present 6.5% policy tool ($6.0\% X + 0.5\% \text{ CPD}$).
- Price-cap era averages are consistently below 4.5%.

Summary of Average X-Factor

1986-97	4.85
1987-97	5.40
1988-97	5.30
1989-97	5.17
1990-97	5.01
1991-97	4.44
1992-97	4.17
1993-97	4.38

Technical Report:
Replication and Update of the X-Factor
Constructed Under FCC Rules

The objective of this project is to replicate and update the X-Factor model adopted by the FCC. The Commission presents a technical description of its data sources and model in Appendix D of its May 1997 order. This appendix provides descriptive text, detailed charts, and X-Factor results for the period 1985-95. Using Appendix D as a guide, this project replicates both the data and formulas adopted by the FCC and updates the Commission's results through 1997. This technical report describes the results of this project.

The body of this report is divided into four parts. Section 1 discusses the effort to duplicate the spreadsheet structure of the FCC model. Sections 2 and 3 describe the data sources and steps required to replicate and update the model's industry-specific and economy-wide data series, respectively. Results are reported for sensitivity tests quantifying the effects on the FCC's results of revisions made by the U.S. government to the economy-wide data series. Section 4 discusses the results for 1996 and 1997 relative to those for the 1985-95 period. A complete set of charts presented in exactly the same format as the Commission's 1997 Appendix D charts is attached as Appendix A to this report. The corresponding charts from the May 1997 FCC Appendix D are presented as Appendix B.

It is important to note at the outset that this project focuses narrowly on replicating and updating the FCC model. No evaluation of the FCC approach to measuring productivity is offered or intended. Nothing in this report should be construed as an endorsement of the FCC's methods for measuring either productivity or the X-Factor.

1. Model Structure

The combination of text and charts in Appendix D to the Commission's 1997 order provides sufficient information to replicate the FCC model. The text clearly identifies the original data series that are to be gathered from external sources. Explicit formulas are provided in the text describing how these original data series are used to construct intermediate and final variables required by the FCC model.

An EXCEL spreadsheet was constructed mimicking the FCC model. It was tested by initializing it only with the FCC data series that the commission staff used to initialize its model. The spreadsheet successfully produced a set of intermediate and final results for 1985-95 identical to those reported in the FCC appendix.

2. Industry Data

Appendix D of the FCC 1997 order identifies the "ARMIS" reports, the Commission's *Statistics of Communications Common Carriers*, and its "Form M" as the primary sources for the industry-specific data series required by its X-Factor model. This project adopts the data set developed by the FCC and presented in Appendix D to its May 1997 order. No independent validation of the FCC data set was conducted.

Updated industry data for 1996 and 1997 were provided by USTA and are presented in Appendix F to this report. Calendar 1995 data also were provided by USTA as a bridge to reconcile each updated data series with the corresponding Appendix D 1985-95 series. The updated series reconciled exactly with the FCC's 1985-95 data with only two exceptions. First, for "switched access minutes" (Chart D4), the 1995 entry in SOCC Table 2.10 is slightly different (less than one percent difference) than the 1995 entry used by the Commission in its 1997 report. To insure consistency with the original FCC study,

switched access minutes for 1996 and 1997 are calculated by applying 1996/95 and 1997/95 growth rates, respectively, from the SOCC report to the 1995 quantity found in the Commission's Appendix D. Second, there is a three-tenths of one percent discrepancy between the Commission's Appendix D level of industry employees in 1995 (Chart D6) and the 1995 employment level reported in SOCC Table 2.9. Following the procedure described above for switched access minutes, updates for 1996 and 1997 are calculated using growth rates. With respect to the 1996 and 1997 data provided by USTA, preliminary estimates are necessary in two instances. First, USTA indicates that updates for 1996 and 1997 "Intrastate DEMs" (Chart D5) are not yet available. Following USTA's recommendation, intrastate DEMs for 1996 and 1997 are projected using the reported value for 1995 and 4.5% growth rates for both 1996 and 1997. Second, ARMIS reporting changes for 1996 labor compensation make it necessary to form an estimate of 1996 RBOC compensation per employee (Chart D6) that maintains consistency with compensation data for earlier and later years. The 1996 estimate is formed by calculating the average annual growth in compensation per employee over the 1995-97 period and applying that growth rate to the 1995 compensation level.¹ The overall result is a complete, consistent set of updated industry data for the 1985-97 period.

3. Data Series Taken or Produced from U.S. Government Sources

There are four data series in the FCC model that are not extracted from industry sources but either are taken directly from or are constructed from data produced by the Bureau of Labor Statistics (BLS) or the Bureau of Economic Analysis (BEA). Two of these series, the input price and total factor productivity (TFP) growth rates for the U.S.

¹ Because of the way labor and material expenses are defined in the FCC model, replacing the ARMIS labor compensation data for 1996 with the estimate described in the text has exactly offsetting effect on the IPD and TFP differential, leaving the 1996 X-Factor unchanged.

nonfarm business sector, appear, respectively, in columns B and E of Chart D1. The other two are price indexes. The “materials price index” and the “composite asset price” appear in Charts D8 and D9, respectively. Either due to changes in underlying government data or to changes in government methodology, these four data series have undergone revisions since the FCC staff constructed the Appendix D charts for its 1997 order. Each of the revised data series is described separately below. The magnitudes of the revisions in terms of their implications for the input price and TFP differentials and the resulting X-Factors are quantified.

U.S. Nonfarm Business Sector TFP and Input Prices: BLS Revisions

The FCC uses the U.S. nonfarm TFP rate as the benchmark for its calculation of the TFP differential. The 1985-95 growth rates reported in column E of Chart D1 in the Commission’s Appendix D correspond to the nonfarm TFP growth rates produced by BLS and reported on page 16 of the BLS News Release, *Multifactor Productivity Trends, 1994* (USDL 95-518). This series was originally produced and currently is maintained and updated by the BLS Office of Productivity and Technology. The BLS updates its TFP series annually. When it does this, it takes the opportunity to incorporate any changes in underlying U.S. data accounts. Revisions therefore occur. The Office of Productivity and Technology was contacted and asked to provide the current nonfarm TFP series consistent with that found in its 1994 release. The most recent series was provided and appears in column E of Chart D1 in Appendix A to this report. Due to BLS revisions, the nonfarm TFP series differs from the corresponding growth rates in the Commission’s original Chart D1 reproduced in Appendix B. (The revised BLS series end in 1996; 1997 estimates will not be available until January 1999. The 1997 growth rate shown in Chart D1 of Appendix A follows the FCC convention of forming an average over TFP growth rates for the preceding five years.)

The BLS Office of Productivity and Technology, as part of its TFP calculation, also produces an input price growth rate for the U.S. nonfarm business sector. The FCC relies on this input price growth rate to calculate its input price differential (IPD). The input price series that existed as of the date the FCC constructed its Appendix D charts appears in column B of Chart D1, Appendix B. The subsequent revision to the BLS nonfarm TFP series led to a similarly revised input price series. This revised series appears in Column B of Chart D1 in Appendix A. Consistent with FCC practice and the estimation of a 1997 TFP growth rate, the 1997 input price growth rate is formed as an average of growth rates over the preceding five years.

The effects of the BLS revisions to its nonfarm TFP and input price growth rates on the IPD, TFP differential, and resulting X-Factors can be seen by comparing columns C, F, and G, respectively, in Chart D1 in Appendix B (the base FCC model) with Chart D1 in Appendix C. The latter chart reflects results for the base FCC model modified only by the BLS revisions to its nonfarm TFP and input price series.² Evaluated over a number of years, the BLS revisions lead to a modest reduction in X-Factors. Comparing the average X-Factors in Appendices B and C calculated for the seven subperiods identified at the bottom of Charts D1 shows that, as a result of the BLS revisions, the average X-Factors remain unchanged in two of the subperiods and fall by only one to three-tenths of a percentage point in the remaining five periods. The average X-Factor for the early price-cap period 1991-95 decreases from 5.2% (Appendix B) to 5.0% (Appendix C).

Materials Price Index: BLS Revisions

The materials price index relied on by the Commission in its Chart D8 also is a function of government data and therefore vulnerable to revision. The methodology the

² The IPD (column B) remains unchanged in one year, rises between .26 and 1.29 percentage points in four of ten years and falls between -.13 and -1.53 percentage points in five years. The TFP differential increases in the range of .15 to .48 percentage points in seven years; it decreases in the range of -.18 to -.76 percentage points in the other three years. The resulting X-Factor increases by .2 to 1.4 percentage points in four years and falls by -.1 to -1.4 percentage points in six years.

Commission used to construct its materials price index is described in general terms at page D-7 of Appendix D to its May 1997 order. For a detailed methodological discussion, the reader is referenced by a Commission footnote to the “Statement of Dr. John R. Norsworthy” which appeared as part of an AT&T submission to the FCC on January 11, 1996. At page 18 of that statement, Norsworthy makes clear that he constructs his materials price index for the RBOCs using (a) input weights derived from the communications industry column in the BLS 183-order input/output tables and (b) corresponding prices taken from BLS interindustry accounts. The material price index constructed for this project and reported in Chart D8 in Appendix A relies on these same BLS data sources and replicates Norsworthy’s methodology.

The resulting materials price index, however, differs from that relied on by the Commission in Appendix D of its May 1997 order. The differences stem from three causes. First, Norsworthy based his materials price index on expenditure shares for the communications industry taken from BLS 183-order input/output tables for 1977, 1987, and 1993. Subsequent to Norsworthy’s analysis, BLS revised its input/output tables for these years to make the underlying industry definitions more consistent with Standard Industrial Classification codes. Second, BLS now has available input/output matrices not only for the three years Norsworthy used but also for 1992, 1995, and 2006. Third, BLS revised the price indexes in its interindustry accounts.

Norsworthy’s indexing method as described in his 1996 statement is applied to the revised BLS data. Input weights are computed from the revised 183-order input/output tables for 1977, 1987, and 1993 as well as the new tables for 1992, 1995, and 2006 (available at [FTP://146.142.4.23/PUB/SPECIAL.REQUESTS/EP/MACRO.DEMAND.IO/](ftp://146.142.4.23/PUB/SPECIAL.REQUESTS/EP/MACRO.DEMAND.IO/)). Unlike Norsworthy, 1992 weights no longer need to be imputed from 1987 and 1993 weights, and 1993 weights do not need to be held constant for 1994 and 1995. Corresponding prices are taken from the revised interindustry accounts (available at [FTP://146.142.4.23/PUB/SPECIAL.REQUESTS/EP/IND.EMPLOYMNET/IND96.DAT](ftp://146.142.4.23/PUB/SPECIAL.REQUESTS/EP/IND.EMPLOYMNET/IND96.DAT)).

Though these prices are available only through 1996, following the FCC convention, each of the 183-order prices for 1997 is estimated based on its 1996 level and its average growth rate over the preceding five years.

The effect of these BLS revisions on the FCC model can be seen by comparing Charts D1 in Appendix B (the FCC base case) and Appendix D to this report. The latter Chart D1 reflects the FCC base case as originally presented in its May 1997 Appendix D altered only by the substitution of the revised material price index described above. A comparison reveals that the BLS revisions affect the IPD and TFP differential in each year but not the resulting X-Factor. The revised materials price index affects the growth in the RBOCs' input prices and therefore affects the IPD directly. Similarly, since the FCC model also uses the materials price index to deflate RBOC material expenses to define "real" material input, the BLS revisions affect RBOC TFP and therefore the productivity differential. The structure of the FCC model, however, guarantees that the resulting effects on the IPD and TFP differentials are exactly offsetting. The result is that the X-Factors are unaffected.

Composite Asset Price: BEA Revisions

The final data series of interest is the BEA composite asset price found in column C of Chart D9. The FCC Appendix D text at page D-8 describes the method the staff used to construct a single asset price index as a function of three BEA asset prices, with asset-specific weights formed from RBOC data for capital additions. For purposes of this project, the indexing formula described on page D-9 of the FCC's descriptive text is applied to data drawn from the same BEA and RBOC sources. Differences in the composite asset prices reported in Appendices A and B (column C, Charts D9) result from BEA revisions to each of the three underlying asset price series as reported in the *Survey of Current Business* tables identified in the FCC text. As was the case for the materials price index, the change in the composite asset price affects the resulting measure of RBOC

capital stock but, given the structure of the FCC productivity model, has an exactly offsetting effect on the price of capital input, also reported in Chart D9. As a result, both the IPD and TFP differentials experience changes, but in exactly offsetting directions. The resulting X-Factors are unchanged. This can be confirmed by comparing Charts D1 in Appendix B (the FCC base case) and Appendix E which reflects the base FCC model amended by the revised BEA composite asset price.

Net Effect of BLS and BEA Revisions

A net assessment of the effect of all four changes can be made by comparing the IPD, TFP differentials, and X-Factors for the 1985-95 period in Charts D1 in Appendices A and B.³ The net effect of the changing IPD and TFP differentials on the X-Factors is that it records an increase ranging from .2 to 1.4 percentage points in four years and a decrease ranging from -.1 to -1.4 percentage points in six years. As described above, however, the average X-Factors for the seven subperiods covered in the original FCC Appendix D show little change. The average X-Factors in the seven subperiods either remain unchanged or decline by no more than three-tenths of a percentage point. If one focuses narrowly on the average of the X-Factor over time, the revisions to U.S. government-produced data series have had little impact on the X-Factor.

4. 1996 and 1997 Update

The results for 1996 and 1997 are formed from a framework wholly consistent with that applied to the 1985-95 period. The 1996 and 1997 results reported in Appendix A are derived using the same formulas applied to all earlier years. USTA provided industry data

³ Over the ten-year period, the IPD increases in four years, ranging from .07 to 1.02 percentage point increases, and declines in six years with the changes ranging from -.21 to -1.7 percentage points. The TFP

for the RBOCs in 1996 and 1997 taken from the same ARMIS, SOCC, and Form M sources as are the 1985-95 data; 1996 and 1997 values of the four variables based on revised U.S. government data are derived from the same updated data as are their earlier counterparts. However, the resulting X-Factors for 1996 and 1997 at 2.1% and 4.1%, respectively, are lower than most of the X-Factors calculated for earlier years. The 2.1% factor for 1996 is the lowest X-Factor since 1986. The 4.1% factor for 1997 is lower than seven of the nine X-Factors over the 1987-95 period. The 6.7% factor for 1995, following rising X-Factors in 1993 and 1994, had been interpreted by some as evidence of an upward trend that would continue into the future. It now is evident that the 1995 X-Factor was a short term cyclical peak.

Following the convention adopted by the Commission in its May 1997 order, various subperiod averages over the annual X-Factors were calculated and are reported at the bottom of Chart D1 in Appendix A. Three observations are worth emphasizing. The first follows from a comparison of the trend in the X-Factor averages formed over the five periods analyzed in the FCC order (1987-95,...,1991-95) with the trend in the seven period averages formed from the updated series (1987-97,...,1993-97). The former reflects the original FCC study timeframe and is unaffected by the 1996/97 update. The latter incorporates the effects of the update through 1997. Both trends are negative suggesting that a longer term downward trend was in place even before the 1996/97 update, perhaps signaling that the more easily attainable cost savings following the transition away from full rate regulation have been completed. Second, each entry in the latter trend is approximately 0.5 percentage points below the corresponding average ending in 1995. Third, no matter which subperiod is selected, none exceeds the present 6.5% policy tool (6.0% X + 0.5% CPD). Price-cap era averages are consistently below 4.5%. In short, the updated FCC model offers no support for a continuation of the Commission's current 6.5% X-Factor.

differential generally increases. It increases in eight of ten years by an amount ranging between .08 and .68 percentage points. It falls in only two years by amounts equaling -.54 and -.75 percentage points.

APPENDIX A

UPDATED FCC MODEL

1985-1997

Chart D1: Components of FCC LEC Price Cap X-Factor [Excluding CPD]

Year	Input Price Growth Rates			Total Factor Productivity Growth Rates			LEC Price/Productivity Differential G=C+F
	Total RBOCs	U.S. Nonfarm Business Sector	Differential	Total RBOCs	U.S. Nonfarm Business Sector	Differential	
	A	B	C=B-A	D	E	F=D-E	
1984							
1985							
1986	5.20%	2.33%	-2.87%	2.84%	1.10%	1.74%	-1.13%
1987	0.77%	3.45%	2.68%	3.18%	-0.50%	3.67%	6.36%
1988	-1.31%	5.02%	6.33%	0.39%	0.30%	0.09%	6.42%
1989	-2.35%	2.42%	4.77%	1.95%	0.20%	1.75%	6.52%
1990	1.81%	3.31%	1.50%	6.78%	-0.70%	7.48%	8.99%
1991	-0.75%	1.77%	2.52%	2.13%	-1.41%	3.54%	6.06%
1992	2.74%	3.15%	0.41%	4.38%	1.71%	2.67%	3.08%
1993	2.44%	2.18%	-0.26%	3.97%	0.20%	3.77%	3.51%
1994	-0.11%	3.37%	3.48%	2.29%	0.30%	1.99%	5.47%
1995	1.14%	2.61%	1.48%	5.02%	-0.20%	5.22%	6.70%
1996	5.79%	3.00%	-2.79%	5.79%	0.89%	4.90%	2.11%
1997	0.64%	2.86%	2.22%	2.50%	0.58%	1.92%	4.14%
Averages							
[1986-94]	0.94%	3.00%	2.06%	3.10%	0.13%	2.97%	5.03%
[1986-95]	0.96%	2.96%	2.00%	3.29%	0.10%	3.19%	5.20%
[1987-95]	0.48%	3.03%	2.55%	3.34%	-0.01%	3.36%	5.90%
[1988-95]	0.45%	2.98%	2.53%	3.37%	0.05%	3.32%	5.84%
[1989-95]	0.70%	2.69%	1.98%	3.79%	0.01%	3.78%	5.76%
[1990-95]	1.21%	2.73%	1.52%	4.10%	-0.02%	4.11%	5.63%
[1991-95]	1.09%	2.62%	1.52%	3.56%	0.12%	3.44%	4.96%
[1986-97]	1.33%	2.95%	1.62%	3.44%	0.21%	3.23%	4.85%
[1987-97]	0.98%	3.01%	2.03%	3.49%	0.13%	3.36%	5.40%
[1988-97]	1.00%	2.97%	1.97%	3.52%	0.19%	3.33%	5.30%
[1989-97]	1.26%	2.74%	1.48%	3.87%	0.17%	3.69%	5.17%
[1990-97]	1.71%	2.78%	1.07%	4.11%	0.17%	3.94%	5.01%
[1991-97]	1.70%	2.70%	1.01%	3.73%	0.30%	3.43%	4.44%
[1992-97]	2.11%	2.86%	0.76%	3.99%	0.58%	3.41%	4.17%
[1993-97]	1.98%	2.80%	0.82%	3.92%	0.35%	3.56%	4.38%

Columns B and E for 1997 are estimated, based on the average of 1992-1996.

Chart D2: RBOC Interstate Revenues

Year	End User A	Interstate Switched Access B	Special Access C	Total Interstate D = A + B + C
1984				
1985	\$1,499,413,893	\$10,906,203,190	\$1,960,688,644	\$14,366,305,727
1986	\$2,400,475,814	\$10,484,265,170	\$2,574,800,716	\$15,459,541,700
1987	\$3,090,639,929	\$9,611,996,187	\$2,657,677,439	\$15,360,313,555
1988	\$3,604,221,000	\$9,662,529,000	\$2,539,698,000	\$15,806,448,000
1989	\$4,398,692,000	\$9,092,575,000	\$2,253,922,000	\$15,745,189,000
1990	\$4,679,142,000	\$8,595,750,000	\$2,209,064,000	\$15,483,956,000
1991	\$4,828,177,000	\$8,514,130,000	\$2,119,037,000	\$15,461,344,000
1992	\$4,963,262,000	\$8,650,880,000	\$2,153,565,000	\$15,767,707,000
1993	\$5,244,094,000	\$8,999,065,000	\$2,097,997,000	\$16,341,156,000
1994	\$5,589,662,000	\$9,293,783,000	\$2,217,125,000	\$17,100,570,000
1995	\$5,770,285,000	\$9,332,869,000	\$2,529,667,000	\$17,632,821,000
1996	\$5,930,960,000	\$9,409,639,000	\$3,070,598,000	\$18,411,197,000
1997	\$6,268,026,000	\$8,763,815,000	\$3,851,028,000	\$18,882,869,000

Chart D3: RBOC REVENUES (Excluding Miscellaneous Services)

	Local Service	Intrastate Toll and Intrastate Access	Interstate	Total
Year	A	B	C	D = A + B + C
1984				
1985	\$26,960,554,164	\$13,047,095,682	\$14,366,305,727	\$54,373,955,573
1986	\$28,626,174,049	\$13,538,946,795	\$15,459,541,700	\$57,624,662,544
1987	\$29,150,842,991	\$14,166,723,124	\$15,360,313,555	\$58,677,879,670
1988	\$29,226,988,000	\$14,994,975,000	\$15,806,448,000	\$60,028,411,000
1989	\$29,973,157,000	\$14,868,219,000	\$15,745,189,000	\$60,586,565,000
1990	\$30,699,085,000	\$15,014,729,000	\$15,483,956,000	\$61,197,770,000
1991	\$32,059,008,000	\$14,522,276,000	\$15,461,344,000	\$62,042,628,000
1992	\$33,359,990,000	\$14,225,181,000	\$15,767,707,000	\$63,352,878,000
1993	\$34,598,957,000	\$14,496,831,000	\$16,341,156,000	\$65,436,944,000
1994	\$35,758,637,000	\$14,355,983,000	\$17,100,570,000	\$67,215,190,000
1995	\$37,684,860,000	\$13,123,225,000	\$17,632,821,000	\$68,440,906,000
1996	\$40,523,387,000	\$12,987,476,000	\$18,411,197,000	\$71,922,060,000
1997	\$42,460,592,000	\$12,308,613,000	\$18,882,869,000	\$73,652,074,000

Chart D4: Calculation of Fisher Ideal Index for Interstate Output

Year	Revenue Shares			Quantities			Output Indices			Interstate Output Quantity Index	Growth
	End User	Interstate Switched Access	Special Access	Access Lines	Switched Access Minutes	Special Access Lines	Laspeyres A	Paasche B	Fisher Relative C=(A*B)^0.5		
1984											
1985	10.44%	75.92%	13.65%	92,671,959	156,853,820,000	1,230,590	1.000000	1.000000	1.000000	1.000000	
1986	15.53%	67.82%	16.66%	95,333,884	157,302,701,000	1,664,101	1.053249	1.052253	1.052751	1.052751	5.14%
1987	20.12%	62.58%	17.30%	98,228,585	173,154,171,000	1,764,445	1.083098	1.078813	1.080953	1.137975	7.78%
1988	22.80%	61.13%	16.07%	98,270,787	187,663,836,000	2,701,817	1.144443	1.114960	1.129605	1.285462	12.19%
1989	27.94%	57.75%	14.31%	101,190,050	210,406,134,000	2,448,090	1.065766	1.058920	1.062338	1.365595	6.05%
1990	30.22%	55.51%	14.27%	103,857,988	231,960,296,000	3,518,005	1.129086	1.114500	1.121769	1.531882	11.49%
1991	31.23%	55.07%	13.71%	107,383,807	246,710,182,000	5,151,699	1.111811	1.094856	1.103301	1.690127	9.83%
1992	31.48%	54.86%	13.66%	108,938,065	262,187,655,000	6,033,139	1.062516	1.060258	1.061386	1.793878	5.96%
1993	32.09%	55.07%	12.84%	112,196,681	278,173,161,000	10,153,615	1.136148	1.102619	1.119258	2.007812	11.27%
1994	32.69%	54.35%	12.97%	115,264,861	298,342,017,323	13,824,365	1.095119	1.086800	1.090952	2.190425	8.71%
1995	32.72%	52.93%	14.35%	119,887,506	334,981,582,000	16,107,677	1.101268	1.099925	1.100596	2.410774	9.59%
1996	32.21%	51.11%	16.68%	125,333,996	362,159,903,714	20,775,150	1.099381	1.098687	1.099034	2.649522	9.44%
1997	33.19%	46.41%	20.39%	131,458,355	387,587,696,669	24,479,958	1.081366	1.083163	1.082264	2.867483	7.91%
										Average[1986-95]	8.80%
										Average[1986-97]	8.78%

Chart D5: Calculation of Fisher Ideal Index for Total Company Output

Year	Revenue Shares			Quantities			Output Indices			Total Company Output Index	Growth
	Local Service	Intrastate Toll and Intrastate Access	Interstate	Number of Local Calls	Intrastate DEMs	Interstate Quantity Index	Laspeyres	Paasche	Fisher Relative $C=(A*B)^{0.5}$		
	A	B	C				A	B			
1984											
1985	49.58%	24.00%	26.42%	310,696,999,600	164,191,177,000	1.000000	1.000000	1.000000	1.000000	1.000000	
1986	49.68%	23.50%	26.83%	315,839,746,231	173,173,536,000	1.052751	1.035272	1.034895	1.035083	1.035083	3.45%
1987	49.68%	24.14%	26.18%	320,735,770,416	183,597,411,000	1.137975	1.043561	1.042639	1.043100	1.079696	4.22%
1988	48.69%	24.98%	26.33%	318,724,184,964	191,904,837,000	1.285462	1.041736	1.039449	1.040592	1.123522	3.98%
1989	49.47%	24.54%	25.99%	330,212,044,704	207,298,177,000	1.365595	1.054001	1.053389	1.053695	1.183850	5.23%
1990	50.16%	24.53%	25.30%	342,403,840,684	217,913,904,000	1.531882	1.062478	1.060759	1.061618	1.256797	5.98%
1991	51.67%	23.41%	24.92%	353,219,571,000	219,713,721,000	1.690127	1.044009	1.042832	1.043420	1.311367	4.25%
1992	52.66%	22.45%	24.89%	365,468,629,000	224,278,538,000	1.793878	1.038080	1.038005	1.038042	1.361254	3.73%
1993	52.87%	22.15%	24.97%	376,995,406,000	227,540,869,000	2.007812	1.049556	1.048164	1.048860	1.427765	4.77%
1994	53.20%	21.36%	25.44%	392,601,075,000	235,362,364,000	2.190425	1.052215	1.052028	1.052121	1.502182	5.08%
1995	55.06%	19.17%	25.76%	409,383,799,000	246,926,539,000	2.410774	1.058829	1.058314	1.058572	1.590167	5.69%
1996	56.34%	18.06%	25.60%	422,262,867,000	258,038,233,255	2.649522	1.051465	1.050451	1.050958	1.671199	4.97%
1997	57.65%	16.71%	25.64%	433,086,737,000	269,649,953,751	2.867483	1.043627	1.042853	1.043240	1.743462	4.23%

Average[1986-97]

Average[1986-95]

The Intrastate DEMs values for 1996 and 1997 are calculated using a 4.5% annual growth rate from the 1995 value.

Chart D6: Labor Input Price and Growth

Year	Total Employees A	Total Compensation B	Labor Rate Annual C = B / A	Labor Price Index (Base = 1985)	Labor Growth %Chg in A
1984					
1985	504,113	16,991,572,326	33705.88	1.000000	
1986	482,698	16,728,435,454	34656.11	1.028192	-4.34%
1987	477,714	16,978,905,847	35541.99	1.054474	-1.04%
1988	466,827	17,030,359,791	36481.09	1.082336	-2.31%
1989	461,149	16,910,850,694	36671.12	1.087974	-1.22%
1990	443,105	17,586,868,921	39690.07	1.177541	-3.99%
1991	414,457	17,186,211,200	41466.81	1.230255	-6.68%
1992	411,167	17,160,988,000	41737.27	1.238279	-0.80%
1993	395,639	17,956,438,000	45385.91	1.346528	-3.85%
1994	367,196	17,154,284,000	46716.97	1.386018	-7.46%
1995	346,843	16,203,522,000	46717.17	1.386024	-5.70%
1996	338,040	16,597,889,075	49100.37	1.456730	-2.57%
1997	338,177	17,451,673,000	51605.14	1.531043	0.04%
				Average[1986-95]	-3.74%
				Average[1986-97]	-3.33%

Chart D7: Summary of Capital Adjustments and Average Depreciation

Year	TPIS.BOY A	Unadj. Additions B	TPIS.EOY C	Retires D=A+B-C	Adjustment Factor E	Adjusted Additions F = B * E	Adjusted EOY TPIS G = A+F-D	Depreciation Accruals H	Adjusted Depreciation Rate I=H/((A+G)/2)
1984									
1985	138,879,365	15,001,998	149,061,793	4,819,569	0.8880	13,321,774	147,381,569	10,241,376	7.155%
1986	149,061,793	14,842,725	159,010,189	4,894,328	0.8880	13,180,340	157,347,804	11,826,961	7.720%
1987	159,010,189	14,138,370	167,720,577	5,427,983	0.8880	12,554,872	166,137,079	13,311,655	8.188%
1988	168,505,114	14,284,742	175,860,216	6,929,640	1.0000	14,284,742	175,860,216	13,134,992	7.629%
1989	175,860,216	13,283,569	182,978,381	6,165,404	1.0000	13,283,569	182,978,381	13,420,810	7.480%
1990	182,978,381	14,476,334	187,168,695	10,286,020	1.0000	14,476,334	187,168,695	13,439,933	7.262%
1991	187,168,695	14,527,049	192,034,545	9,661,199	1.0000	14,527,049	192,034,545	13,200,593	6.962%
1992	192,034,545	14,611,866	196,411,915	10,234,496	1.0000	14,611,866	196,411,915	13,337,581	6.867%
1993	196,411,915	14,860,116	203,082,418	8,189,613	1.0000	14,860,116	203,082,418	14,032,782	7.025%
1994	203,082,418	14,717,999	209,325,562	8,474,855	1.0000	14,717,999	209,325,562	14,863,196	7.208%
1995	209,325,562	15,374,568	217,430,207	7,269,923	1.0000	15,374,568	217,430,207	15,358,553	7.198%
1996	217,430,207	18,026,150	227,317,120	8,139,237	1.0000	18,026,150	227,317,120	16,252,281	7.309%
1997	227,317,120	18,253,199	236,896,179	8,674,140	1.0000	18,253,199	236,896,179	16,667,034	7.181%
							Average[1985-95]		7.336%
							Average[1985-97]		7.322%

Chart D8: Construction of Materials Quantity Index

Year	Materials Price Index (1985=1.00) A	Operating Expense B	Depreciation & Amortization Expense C	Employee Compensation D	Materials Expense E = B - C - D	Materials Quantity Index F = E / A	Materials Quantity Index (1985 = 1.0) G	Materials Quantity Index Growth H
1984								
1985	1.000000	40,953,072,435	10,024,710,656	16,991,572,326	13,936,789,453	13,936,789,453	1.000000	
1986	1.031346	42,424,084,849	11,592,001,248	16,728,435,454	14,103,648,147	13,674,987,526	0.981215	-1.90%
1987	1.053529	44,293,127,430	13,316,999,560	16,978,905,847	13,997,222,023	13,286,033,126	0.953307	-2.89%
1988	1.086392	46,809,139,000	13,646,937,000	17,030,359,791	16,131,842,209	14,849,003,149	1.065454	11.12%
1989	1.126234	48,600,813,000	13,860,101,000	16,910,850,694	17,829,861,306	15,831,394,231	1.135943	6.41%
1990	1.172025	49,544,744,000	13,931,515,000	17,586,868,921	18,026,360,079	15,380,530,820	1.103592	-2.89%
1991	1.204935	50,901,049,000	13,499,778,000	17,186,211,200	20,215,059,800	16,776,884,245	1.203784	8.69%
1992	1.234797	50,698,625,000	13,822,882,000	17,160,988,000	19,714,755,000	15,965,992,971	1.145601	-4.95%
1993	1.255352	52,766,635,000	14,244,514,000	17,956,438,000	20,565,683,000	16,382,401,649	1.175479	2.57%
1994	1.291436	55,916,863,000	15,068,058,000	17,154,284,000	23,694,521,000	18,347,418,469	1.316474	11.33%
1995	1.321671	56,831,094,000	15,556,284,000	16,203,522,000	25,071,288,000	18,969,381,288	1.361101	3.33%
1996	1.361400	57,884,494,000	16,377,242,000	16,597,889,075	24,909,362,925	18,296,870,339	1.312847	-3.61%
1997	1.395497	59,731,175,000	16,758,832,000	17,451,673,000	25,520,670,000	18,287,867,671	1.312201	-0.05%

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Chart D8a: Adjustments of 1985-87 RBOC Operating Expenses for Accounting Changes

	USTA Study Operating Expense A	Nonregulated Expense Adjustmts B	Capital/Expense Shift C	Shift Factor D = (A+B+C)/A	RBOC Operating Expense E	Adjusted Operating Exp. F = D * E
1985	46,223,368,251	406,886,403	1,985,079,714	1.05175	38,938,104,053	40,953,072,435
1986	48,113,849,487	471,112,072	1,959,363,711	1.05052	40,384,079,165	42,424,084,849
1987	49,562,282,080	1,089,570,002	1,908,791,665	1.06050	41,766,392,483	44,293,127,430

Chart D9: Capital Quantity and Price Index Calculations

Year	Benchmark A	Adjusted Capital Additions B	BEA Composite Asset Price C	Capital Stock Quantity D	Capital Input Quantity E	Capital Input Quantity Growth F	Property Income /w Depreciation G	Capital Rental Price** H	Capital Rental Price Index I	Rental Price Index Growth J
1984		n/a		103,903,095						
1985	109,602,959	13,321,774	1.000000	109,602,710	1.000000		23,445,593,794	0.225648657	1.000000	
1986		13,180,340	1.019856	114,486,161	1.054855	0.053403	26,792,578,943	0.244451792	1.083329	8.00%
1987		12,554,872	1.044366	118,109,174	1.101855	0.043592	27,701,751,800	0.241965941	1.072313	-1.02%
1988		14,284,742	1.044248	123,124,340	1.136724	0.031155	26,866,209,000	0.227469282	1.008068	-6.18%
1989		13,283,569	1.062054	126,599,573	1.184992	0.041585	25,845,853,000	0.209916683	0.930281	-8.03%
1990		14,476,334	1.076468	130,760,432	1.218439	0.027834	25,584,541,000	0.202090264	0.895597	-3.80%
1991		14,527,049	1.090143	134,493,889	1.258484	0.032338	24,641,357,000	0.188446586	0.835133	-6.99%
1992		14,611,866	1.099554	137,916,544	1.294417	0.028152	26,477,135,000	0.196864966	0.872440	4.37%
1993		14,860,116	1.094843	141,372,039	1.327357	0.025130	26,914,823,000	0.195152969	0.864853	-0.87%
1994		14,717,999	1.087579	144,534,029	1.360614	0.024746	26,366,385,000	0.186503534	0.826522	-4.53%
1995		15,374,568	1.067533	148,333,219	1.391046	0.022120	27,166,096,000	0.187956401	0.832960	0.78%
1996		18,026,150	1.050090	154,618,035	1.427611	0.025946	30,414,808,000	0.205043807	0.908686	8.70%
1997		18,253,199	1.050090	160,658,026	1.488098	0.041497	30,679,731,000	0.198422719	0.879344	-3.28%

Chart D10: Factor Shares of Total Payments

Year	Labor Compensation	Materials Payment	Property Income /w Depreciation	Total Factor Payment	Labor Compensation Share	Materials Payment Share	Property Income /w Depreciation Share
1984							
1985	16,991,572,326	13,936,789,453	23,445,593,794	54,373,955,573	31.25%	25.63%	43.12%
1986	16,728,435,454	14,103,648,147	26,792,578,943	57,624,662,544	29.03%	24.48%	46.49%
1987	16,978,905,847	13,997,222,023	27,701,751,800	58,677,879,670	28.94%	23.85%	47.21%
1988	17,030,359,791	16,131,842,209	26,866,209,000	60,028,411,000	28.37%	26.87%	44.76%
1989	16,910,850,694	17,829,861,306	25,845,853,000	60,586,565,000	27.91%	29.43%	42.66%
1990	17,586,868,921	18,026,360,079	25,584,541,000	61,197,770,000	28.74%	29.46%	41.81%
1991	17,186,211,200	20,215,059,800	24,641,357,000	62,042,628,000	27.70%	32.58%	39.72%
1992	17,160,988,000	19,714,755,000	26,477,135,000	63,352,878,000	27.09%	31.12%	41.79%
1993	17,956,438,000	20,565,683,000	26,914,823,000	65,436,944,000	27.44%	31.43%	41.13%
1994	17,154,284,000	23,694,521,000	26,366,385,000	67,215,190,000	25.52%	35.25%	39.23%
1995	16,203,522,000	25,071,288,000	27,166,096,000	68,440,906,000	23.68%	36.63%	39.69%
1996	16,597,889,075	24,909,362,925	30,414,808,000	71,922,060,000	23.08%	34.63%	42.29%
1997	17,451,673,000	25,520,670,000	30,679,731,000	73,652,074,000	23.69%	34.65%	41.65%

Chart D11: Input Quantity Index

Year	Shares			Quantities			Quantity Indices				Growth
	Labor	Materials	Property	Labor	Materials	Capital	Laspeyres	Paasche	Fisher	Fisher	
	Compensation	Payment	Income /w Depreciation				A	B	Relative $C=(A*B)^{0.5}$	Chain	
1984											
1985	31.25%	25.63%	43.12%	504,113	13,936,789,453	1.00000	1.00000	1.00000	1.00000	1.00000	
1986	29.03%	24.48%	46.49%	482,698	13,674,987,526	1.05486	0.96820	0.96822	1.00611	1.00611	0.61%
1987	28.94%	23.85%	47.21%	477,714	13,286,033,126	1.10186	0.98139	0.98140	1.01050	1.01667	1.04%
1988	28.37%	26.87%	44.76%	466,827	14,849,003,149	1.13672	1.04067	1.04083	1.03655	1.05384	3.59%
1989	27.91%	29.43%	42.66%	461,149	15,831,394,231	1.18499	1.02594	1.02654	1.03330	1.08893	3.28%
1990	28.74%	29.46%	41.81%	443,105	15,380,530,820	1.21844	0.96634	0.96623	0.99198	1.08019	-0.81%
1991	27.70%	32.58%	39.72%	414,457	16,776,884,245	1.25848	1.01403	1.01340	1.02147	1.10339	2.12%
1992	27.09%	31.12%	41.79%	411,167	15,965,992,971	1.29442	0.97023	0.97005	0.99353	1.09625	-0.65%
1993	27.44%	31.43%	41.13%	395,639	16,382,401,649	1.32736	0.99637	0.99530	1.00800	1.10502	0.80%
1994	25.52%	35.25%	39.23%	367,196	18,347,418,469	1.36061	1.03052	1.03050	1.02832	1.13631	2.79%
1995	23.68%	36.63%	39.69%	346,843	18,969,381,288	1.39105	0.99639	0.99689	1.00671	1.14394	0.67%
1996	23.08%	34.63%	42.29%	338,040	18,296,870,339	1.42761	0.96850	0.96855	0.99180	1.13455	-0.82%
1997	23.69%	34.65%	41.65%	338,177	18,287,867,671	1.48810	0.99987	0.99987	1.01749	1.15440	1.73%

Chart D12: Input Price Index

	Shares			Prices			Price Indices				Growth
	Labor Compensation	Materials Payment	Property Income /w Depreciation	Labor	Materials	Capital	Laspeyres A	Paasche B	Fisher Relative C=(A*B)^0.5	Fisher Chain	
Year											
1984											
1985	31.25%	25.63%	43.12%	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	
1986	29.03%	24.48%	46.49%	1.02819	1.03135	1.08333	1.06395	1.06482	1.05335	1.05335	5.20%
1987	28.94%	23.85%	47.21%	1.05447	1.05353	1.07231	1.00076	1.00024	1.00770	1.06146	0.77%
1988	28.37%	26.87%	44.76%	1.08234	1.08639	1.00807	0.97067	0.97232	0.98694	1.04759	-1.31%
1989	27.91%	29.43%	42.66%	1.08797	1.12623	0.93028	0.96555	0.96615	0.97677	1.02326	-2.35%
1990	28.74%	29.46%	41.81%	1.17754	1.17202	0.89560	0.99454	0.99347	1.01826	1.04194	1.81%
1991	27.70%	32.58%	39.72%	1.23025	1.20494	0.83513	0.97200	0.97327	0.99249	1.03412	-0.75%
1992	27.09%	31.12%	41.79%	1.23828	1.23480	0.87244	1.03571	1.03609	1.02777	1.06283	2.74%
1993	27.44%	31.43%	41.13%	1.34653	1.25535	0.86485	1.00212	1.00212	1.02470	1.08908	2.44%
1994	25.52%	35.25%	39.23%	1.38602	1.29144	0.82652	0.98733	0.98892	0.99889	1.08787	-0.11%
1995	23.68%	36.63%	39.69%	1.38602	1.32167	0.83296	1.01518	1.01523	1.01145	1.10033	1.14%
1996	23.08%	34.63%	42.29%	1.45673	1.36140	0.90869	1.06171	1.06265	1.05956	1.16586	5.79%
1997	23.69%	34.65%	41.65%	1.53104	1.39550	0.87934	0.99352	0.99293	1.00645	1.17338	0.64%

APPENDIX B

ORIGINAL FCC MODEL

1985-1995

Chart D1: Components of FCC LEC Price Cap X-Factor [Excluding CPD]

Year	Input Price Growth Rates			Total Factor Productivity Growth Rates			LEC
	Total	U.S. Nonfarm	Differential	Total	U.S. Nonfarm	Differential	Price/Productivity
	RBOCs A	Business Sector B	C=B-A	RBOCs D	Business Sector E	F=D-E	Differential G=C+F
1984							
1985							
1986	4.94%	2.81%	-2.13%	2.58%	0.92%	1.66%	-0.47%
1987	0.56%	2.53%	1.97%	2.97%	-0.02%	2.99%	4.96%
1988	-1.58%	3.73%	5.31%	0.12%	0.46%	-0.34%	4.97%
1989	-2.36%	3.04%	5.40%	1.94%	-0.55%	2.49%	7.89%
1990	1.88%	3.31%	1.43%	6.85%	-0.47%	7.32%	8.76%
1991	-0.85%	2.06%	2.91%	2.03%	-0.89%	2.92%	5.83%
1992	2.68%	2.88%	0.20%	4.32%	1.10%	3.22%	3.42%
1993	2.27%	3.72%	1.45%	3.80%	0.55%	3.25%	4.70%
1994	-0.19%	3.50%	3.69%	2.21%	0.50%	1.71%	5.40%
1995	1.32%	3.09%	1.77%	5.20%	0.16%	5.04%	6.81%
Averages							
[1986-94]	0.82%	3.06%	2.25%	2.98%	0.18%	2.80%	5.05%
[1986-95]	0.87%	3.07%	2.20%	3.20%	0.18%	3.03%	5.23%
[1987-95]	0.41%	3.10%	2.68%	3.27%	0.09%	3.18%	5.86%
[1988-95]	0.39%	3.17%	2.77%	3.31%	0.11%	3.20%	5.97%
[1989-95]	0.68%	3.09%	2.41%	3.77%	0.06%	3.71%	6.12%
[1990-95]	1.18%	3.09%	1.91%	4.07%	0.16%	3.91%	5.82%
[1991-95]	1.04%	3.05%	2.01%	3.51%	0.28%	3.23%	5.23%

Chart D2: RBOC Interstate Revenues

Year	End User A	Interstate Switched Access B	Special Access C	Total Interstate D = A + B + C
1984				
1985	\$1,499,413,893	\$10,906,203,190	\$1,960,688,644	\$14,366,305,727
1986	\$2,400,475,814	\$10,484,265,170	\$2,574,800,716	\$15,459,541,700
1987	\$3,090,639,929	\$9,611,996,187	\$2,657,677,439	\$15,360,313,555
1988	\$3,604,221,000	\$9,662,529,000	\$2,539,698,000	\$15,806,448,000
1989	\$4,398,692,000	\$9,092,575,000	\$2,253,922,000	\$15,745,189,000
1990	\$4,679,142,000	\$8,595,750,000	\$2,209,064,000	\$15,483,956,000
1991	\$4,828,177,000	\$8,514,130,000	\$2,119,037,000	\$15,461,344,000
1992	\$4,963,262,000	\$8,650,880,000	\$2,153,565,000	\$15,767,707,000
1993	\$5,244,094,000	\$8,999,065,000	\$2,097,997,000	\$16,341,156,000
1994	\$5,589,662,000	\$9,293,783,000	\$2,217,125,000	\$17,100,570,000
1995	\$5,770,285,000	\$9,332,869,000	\$2,529,667,000	\$17,632,821,000

Chart D3: RBOC REVENUES (Excluding Miscellaneous Services)

Year	Local Service	Intrastate Toll and Intrastate Access	Interstate	Total
	A	B	C	D = A + B + C
1984				
1985	\$26,960,554,164	\$13,047,095,682	\$14,366,305,727	\$54,373,955,573
1986	\$28,626,174,049	\$13,538,946,795	\$15,459,541,700	\$57,624,662,544
1987	\$29,150,842,991	\$14,166,723,124	\$15,360,313,555	\$58,677,879,670
1988	\$29,226,988,000	\$14,994,975,000	\$15,806,448,000	\$60,028,411,000
1989	\$29,973,157,000	\$14,868,219,000	\$15,745,189,000	\$60,586,565,000
1990	\$30,699,085,000	\$15,014,729,000	\$15,483,956,000	\$61,197,770,000
1991	\$32,059,008,000	\$14,522,276,000	\$15,461,344,000	\$62,042,628,000
1992	\$33,359,990,000	\$14,225,181,000	\$15,767,707,000	\$63,352,878,000
1993	\$34,598,957,000	\$14,496,831,000	\$16,341,156,000	\$65,436,944,000
1994	\$35,758,637,000	\$14,355,983,000	\$17,100,570,000	\$67,215,190,000
1995	\$37,684,860,000	\$13,123,225,000	\$17,632,821,000	\$68,440,906,000

Chart D4: Calculation of Fisher Ideal Index for Interstate Output

Year	Revenue Shares			Quantities			Output Indices			Interstate Output Quantity Index	Growth
	End User	Interstate Switched Access	Special Access	Access Lines	Switched Access Minutes	Special Access Lines	Laspeyres A	Paasche B	Fisher Relative $C=(A*B)^{0.5}$		
1984											
1985	10.44%	75.92%	13.65%	92,671,959	156,853,820,000	1,230,590	1.000000	1.000000	1.000000	1.000000	
1986	15.53%	67.82%	16.66%	95,333,884	157,302,701,000	1,664,101	1.053249	1.052253	1.052751	1.052751	5.14%
1987	20.12%	62.58%	17.30%	98,228,585	173,154,171,000	1,764,445	1.083098	1.078813	1.080953	1.137975	7.78%
1988	22.80%	61.13%	16.07%	98,270,787	187,663,836,000	2,701,817	1.144443	1.114960	1.129605	1.285462	12.19%
1989	27.94%	57.75%	14.31%	101,190,050	210,406,134,000	2,448,090	1.065766	1.058920	1.062338	1.365595	6.05%
1990	30.22%	55.51%	14.27%	103,857,988	231,960,296,000	3,518,005	1.129086	1.114500	1.121769	1.531882	11.49%
1991	31.23%	55.07%	13.71%	107,383,807	246,710,182,000	5,151,699	1.111811	1.094856	1.103301	1.690127	9.83%
1992	31.48%	54.86%	13.66%	108,938,065	262,187,655,000	6,033,139	1.062516	1.060258	1.061386	1.793878	5.96%
1993	32.09%	55.07%	12.84%	112,196,681	278,173,161,000	10,153,615	1.136148	1.102619	1.119258	2.007812	11.27%
1994	32.69%	54.35%	12.97%	115,264,861	298,342,017,323	13,824,365	1.095119	1.086800	1.090952	2.190425	8.71%
1995	32.72%	52.93%	14.35%	119,887,506	334,981,582,000	16,107,677	1.101268	1.099925	1.100596	2.410774	9.59%
Average[1986-95]											8.80%

Chart D5: Calculation of Fisher Ideal Index for Total Company Output

Year	Revenue Shares			Quantities			Output Indices			Total Company Output Index	Growth
	Local Service	Intrastate Toll and Intrastate Access	Interstate	Number of Local Calls	Intrastate DEMs	Interstate Quantity Index	Laspeyres	Paasche	Fisher Relative $C=(A*B)^{0.5}$		
	A	B	C				A	B			
1984											
1985	49.58%	24.00%	26.42%	310,696,999,600	164,191,177,000	1.000000	1.000000	1.000000	1.000000	1.000000	
1986	49.68%	23.50%	26.83%	315,839,746,231	173,173,536,000	1.052751	1.035272	1.034895	1.035083	1.035083	3.45%
1987	49.68%	24.14%	26.18%	320,735,770,416	183,597,411,000	1.137975	1.043561	1.042639	1.043100	1.079696	4.22%
1988	48.69%	24.98%	26.33%	318,724,184,964	191,904,837,000	1.285462	1.041736	1.039449	1.040592	1.123522	3.98%
1989	49.47%	24.54%	25.99%	330,212,044,704	207,298,177,000	1.365595	1.054001	1.053389	1.053695	1.183850	5.23%
1990	50.16%	24.53%	25.30%	342,403,840,684	217,913,904,000	1.531882	1.062478	1.060759	1.061618	1.256797	5.98%
1991	51.67%	23.41%	24.92%	353,219,571,000	219,713,721,000	1.690127	1.044009	1.042832	1.043420	1.311367	4.25%
1992	52.66%	22.45%	24.89%	365,468,629,000	224,278,538,000	1.793878	1.038080	1.038005	1.038042	1.361254	3.73%
1993	52.87%	22.15%	24.97%	376,995,406,000	227,540,869,000	2.007812	1.049556	1.048164	1.048860	1.427765	4.77%
1994	53.20%	21.36%	25.44%	392,601,075,000	235,362,364,000	2.190425	1.052215	1.052028	1.052121	1.502182	5.08%
1995	55.06%	19.17%	25.76%	409,383,799,000	246,926,539,000	2.410774	1.058829	1.058314	1.058572	1.590167	5.69%
Average[1986-95]											4.64%

Chart D6: Labor Input Price and Growth

Year	Total Employees A	Total Compensation B	Labor Rate Annual C = B / A	Labor Price Index (Base = 1985)	Labor Growth %Chg in A
1984					
1985	504,113	16,991,572,326	33705.88	1.000000	
1986	482,698	16,728,435,454	34656.11	1.028192	-4.34%
1987	477,714	16,978,905,847	35541.99	1.054474	-1.04%
1988	466,827	17,030,359,791	36481.09	1.082336	-2.31%
1989	461,149	16,910,850,694	36671.12	1.087974	-1.22%
1990	443,105	17,586,868,921	39690.07	1.177541	-3.99%
1991	414,457	17,186,211,200	41466.81	1.230255	-6.68%
1992	411,167	17,160,988,000	41737.27	1.238279	-0.80%
1993	395,639	17,956,438,000	45385.91	1.346528	-3.85%
1994	367,196	17,154,284,000	46716.97	1.386018	-7.46%
1995	346,843	16,203,522,000	46717.17	1.386024	-5.70%
				Average[1986-95]	-3.74%

Chart D7: Summary of Capital Adjustments and Average Depreciation

Year	TPIS.BOY A	Unadj. Additions B	TPIS.EOY C	Retires D=A+B-C	Adjustment Factor E	Adjusted Additions F = B * E	Adjusted EOY TPIS G = A+F-D	Depreciation Accruals H	Adjusted Depreciation Rate I=H/((A+G)/2)
1984									
1985	138,879,365	15,001,998	149,061,793	4,819,569	0.8880	13,321,774	147,381,569	10,241,376	7.155%
1986	149,061,793	14,842,725	159,010,189	4,894,328	0.8880	13,180,340	157,347,804	11,826,961	7.720%
1987	159,010,189	14,138,370	167,720,577	5,427,983	0.8880	12,554,872	166,137,079	13,311,655	8.188%
1988	168,505,114	14,284,742	175,860,216	6,929,640	1.0000	14,284,742	175,860,216	13,134,992	7.629%
1989	175,860,216	13,283,569	182,978,381	6,165,404	1.0000	13,283,569	182,978,381	13,420,810	7.480%
1990	182,978,381	14,476,334	187,168,695	10,286,020	1.0000	14,476,334	187,168,695	13,439,933	7.262%
1991	187,168,695	14,527,049	192,034,545	9,661,199	1.0000	14,527,049	192,034,545	13,200,593	6.962%
1992	192,034,545	14,611,866	196,411,915	10,234,496	1.0000	14,611,866	196,411,915	13,337,581	6.867%
1993	196,411,915	14,860,116	203,082,418	8,189,613	1.0000	14,860,116	203,082,418	14,032,782	7.025%
1994	203,082,418	14,717,999	209,325,562	8,474,855	1.0000	14,717,999	209,325,562	14,863,196	7.208%
1995	209,325,562	15,374,568	217,430,207	7,269,923	1.0000	15,374,568	217,430,207	15,358,553	7.198%
Average[1985-95]									7.336%

Chart D8: Construction of Materials Quantity Index

Year	Materials Price Index (1985=1.00) A	Operating Expense B	Depreciation & Amortization Expense C	Employee Compensation D	Materials Expense E = B - C - D	Materials Quantity Index F = E / A	Materials Quantity Index (1985 = 1.0) G	Materials Quantity Index Growth H
1984								
1985	1.000000	40,953,072,435	10,024,710,656	16,991,572,326	13,936,789,453	13,936,789,453	1.000000	
1986	1.020800	42,424,084,849	11,592,001,248	16,728,435,454	14,103,648,147	13,816,269,736	0.991352	-0.87%
1987	1.035400	44,293,127,430	13,316,999,560	16,978,905,847	13,997,222,023	13,518,661,409	0.969998	-2.18%
1988	1.059000	46,809,139,000	13,646,937,000	17,030,359,791	16,131,842,209	15,233,089,905	1.093013	11.94%
1989	1.098500	48,600,813,000	13,860,101,000	16,910,850,694	17,829,861,306	16,231,098,139	1.164622	6.35%
1990	1.143400	49,544,744,000	13,931,515,000	17,586,868,921	18,026,360,079	15,765,576,420	1.131220	-2.91%
1991	1.169300	50,901,049,000	13,499,778,000	17,186,211,200	20,215,059,800	17,288,172,240	1.240470	9.22%
1992	1.193800	50,698,625,000	13,822,882,000	17,160,988,000	19,714,755,000	16,514,286,313	1.184942	-4.58%
1993	1.205700	52,766,635,000	14,244,514,000	17,956,438,000	20,565,683,000	17,057,048,188	1.223886	3.23%
1994	1.234200	55,916,863,000	15,068,058,000	17,154,284,000	23,694,521,000	19,198,283,098	1.377526	11.83%
1995	1.263900	56,831,094,000	15,556,284,000	16,203,522,000	25,071,288,000	19,836,449,086	1.423316	3.27%

Chart D8a: Adjustments of 1985-87 RBOC Operating Expenses for Accounting Changes

	USTA Study Operating Expense A	Nonregulated Expense Adjustmts B	Capital/Expense Shift C	Shift Factor D = (A+B+C)/A	RBOC Operating Expense E	Adjusted Operating Exp. F = D * E
1985	46,223,368,251	406,886,403	1,985,079,714	1.05175	38,938,104,053	40,953,072,435
1986	48,113,849,487	471,112,072	1,959,363,711	1.05052	40,384,079,165	42,424,084,849
1987	49,562,282,080	1,089,570,002	1,908,791,665	1.06050	41,766,392,483	44,293,127,430

Chart D9: Capital Quantity and Price Index Calculations

Year	Benchmark A	Adjusted Capital Additions B	BEA Composite Asset Price C	Capital Stock Quantity D	Capital Input Quantity E	Capital Input Quantity Growth F	Property Income /w Depreciation G	Capital Rental Price** H	Capital Rental Price Index I	Rental Price Index Growth J
1984		n/a		103,903,095						
1985	109,602,959	13,321,774	1.000000	109,602,710	1.000000		23,445,593,794	0.225648657	1.000000	
1986		13,180,340	1.013181	114,571,307	1.054855	0.053403	26,792,578,943	0.244451792	1.083329	8.00%
1987		12,554,872	1.030871	118,345,444	1.102675	0.044335	27,701,751,800	0.24178612	1.071516	-1.10%
1988		14,284,742	1.035999	123,452,193	1.138998	0.032410	26,866,209,000	0.227015153	1.006056	-6.30%
1989		13,283,569	1.075241	126,749,984	1.188147	0.042246	25,845,853,000	0.209359205	0.927811	-8.10%
1990		14,476,334	1.092233	130,705,704	1.219887	0.026363	25,584,541,000	0.201850448	0.894534	-3.65%
1991		14,527,049	1.106013	134,251,960	1.257958	0.030732	24,641,357,000	0.188525491	0.835482	-6.83%
1992		14,611,866	1.111942	137,544,312	1.292088	0.026770	26,477,135,000	0.197219728	0.874012	4.51%
1993		14,860,116	1.123482	140,681,129	1.323775	0.024228	26,914,823,000	0.195681106	0.867194	-0.78%
1994		14,717,999	1.140461	143,266,301	1.353965	0.022550	26,366,385,000	0.187419487	0.830581	-4.31%
1995		15,374,568	1.150848	146,115,862	1.378845	0.018209	27,166,096,000	0.189619581	0.840331	1.17%

Column C from Capital Price Index Workbook

Chart D10: Factor Shares of Total Payments

Year	Labor Compensation	Materials Payment	Property Income /w Depreciation	Total Factor Payment	Labor Compensation Share	Materials Payment Share	Property Income /w Depreciation Share
1984							
1985	16,991,572,326	13,936,789,453	23,445,593,794	54,373,955,573	31.25%	25.63%	43.12%
1986	16,728,435,454	14,103,648,147	26,792,578,943	57,624,662,544	29.03%	24.48%	46.49%
1987	16,978,905,847	13,997,222,023	27,701,751,800	58,677,879,670	28.94%	23.85%	47.21%
1988	17,030,359,791	16,131,842,209	26,866,209,000	60,028,411,000	28.37%	26.87%	44.76%
1989	16,910,850,694	17,829,861,306	25,845,853,000	60,586,565,000	27.91%	29.43%	42.66%
1990	17,586,868,921	18,026,360,079	25,584,541,000	61,197,770,000	28.74%	29.46%	41.81%
1991	17,186,211,200	20,215,059,800	24,641,357,000	62,042,628,000	27.70%	32.58%	39.72%
1992	17,160,988,000	19,714,755,000	26,477,135,000	63,352,878,000	27.09%	31.12%	41.79%
1993	17,956,438,000	20,565,683,000	26,914,823,000	65,436,944,000	27.44%	31.43%	41.13%
1994	17,154,284,000	23,694,521,000	26,366,385,000	67,215,190,000	25.52%	35.25%	39.23%
1995	16,203,522,000	25,071,288,000	27,166,096,000	68,440,906,000	23.68%	36.63%	39.69%

Chart D11: Input Quantity Index

Year	Shares			Quantities			Quantity Indexes				Growth
	Labor Compensation	Materials Payment	Property Income /w Depreciation	Labor	Materials	Capital	Laspeyers	Paasche	Fisher Relative	Fisher Chain	
							A	B	C=(A*B)^0.5		
1984											
1985	31.25%	25.63%	43.12%	504,113	13,936,789,453	1.00000	1.00000	1.00000	1.00000	1.00000	
1986	29.03%	24.48%	46.49%	482,698	13,816,269,736	1.05486	0.97277	0.97270	1.00871	1.00871	0.87%
1987	28.94%	23.85%	47.21%	477,714	13,518,661,409	1.10267	0.98454	0.98458	1.01258	1.02140	1.25%
1988	28.37%	26.87%	44.76%	466,827	15,233,089,905	1.13900	1.04481	1.04468	1.03930	1.06154	3.85%
1989	27.91%	29.43%	42.66%	461,149	16,231,098,139	1.18815	1.02562	1.02623	1.03343	1.09702	3.29%
1990	28.74%	29.46%	41.81%	443,105	15,765,576,420	1.21989	0.96623	0.96613	0.99130	1.08748	-0.87%
1991	27.70%	32.58%	39.72%	414,457	17,288,172,240	1.25796	1.01696	1.01609	1.02248	1.11192	2.22%
1992	27.09%	31.12%	41.79%	411,167	16,514,286,313	1.29209	0.97216	0.97203	0.99416	1.10543	-0.59%
1993	27.44%	31.43%	41.13%	395,639	17,057,048,188	1.32377	1.00000	0.99869	1.00970	1.11615	0.97%
1994	25.52%	35.25%	39.23%	367,196	19,198,283,098	1.35396	1.03351	1.03324	1.02911	1.14865	2.87%
1995	23.68%	36.63%	39.69%	346,843	19,836,449,086	1.37885	0.99600	0.99652	1.00493	1.15431	0.49%

Chart D12: Input Price Index

Year	Shares			Quantities			Quantity Indexes				Growth
	Labor	Materials	Property	Labor	Materials	Capital	Laspeyers	Paasche	Fisher	Fisher	
	Compensation	Payment	Income /w Depreciation				A	B	Relative $C=(A*B)^{0.5}$	Chain	
1984											
1985	31.25%	25.63%	43.12%	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	
1986	29.03%	24.48%	46.49%	1.02819	1.02080	1.08333	1.06002	1.06092	1.05064	1.05064	4.94%
1987	28.94%	23.85%	47.21%	1.05447	1.03540	1.07152	0.99779	0.99742	1.00563	1.05655	0.56%
1988	28.37%	26.87%	44.76%	1.08234	1.05900	1.00606	0.96707	0.96872	0.98433	1.03999	-1.58%
1989	27.91%	29.43%	42.66%	1.08797	1.09850	0.92781	0.96540	0.96597	0.97665	1.01571	-2.36%
1990	28.74%	29.46%	41.81%	1.17754	1.14340	0.89453	0.99546	0.99444	1.01895	1.03496	1.88%
1991	27.70%	32.58%	39.72%	1.23025	1.16930	0.83548	0.97064	0.97196	0.99152	1.02618	-0.85%
1992	27.09%	31.12%	41.79%	1.23828	1.19380	0.87401	1.03478	1.03523	1.02712	1.05401	2.68%
1993	27.44%	31.43%	41.13%	1.34653	1.20570	0.86719	0.99978	0.99982	1.02297	1.07822	2.27%
1994	25.52%	35.25%	39.23%	1.38602	1.23420	0.83058	0.98631	0.98786	0.99812	1.07619	-0.19%
1995	23.68%	36.63%	39.69%	1.38602	1.26390	0.84033	1.01757	1.01762	1.01324	1.09044	1.32%

APPENDIX C

MODIFIED FCC MODEL

(BLS NONFARM TFP AND INPUT PRICE SERIES)

1985-1995

Chart D1: Components of FCC LEC Price Cap X-Factor [Excluding CPD]

Year	Input Price Growth Rates			Total Factor Productivity Growth Rates			LEC Price/Productivity Differential G=C+F
	Total RBOCs	U.S. Nonfarm Business Sector	Differential	Total RBOCs	U.S. Nonfarm Business Sector	Differential	
	A	B	C=B-A	D	E	F=D-E	
1984							
1985							
1986	4.94%	2.33%	-2.61%	2.58%	1.10%	1.48%	-1.13%
1987	0.56%	3.45%	2.89%	2.97%	-0.50%	3.47%	6.36%
1988	-1.58%	5.02%	6.60%	0.12%	0.30%	-0.18%	6.42%
1989	-2.36%	2.42%	4.78%	1.94%	0.20%	1.74%	6.52%
1990	1.88%	3.31%	1.43%	6.85%	-0.70%	7.55%	8.99%
1991	-0.85%	1.77%	2.62%	2.03%	-1.41%	3.44%	6.06%
1992	2.68%	3.15%	0.47%	4.32%	1.71%	2.61%	3.08%
1993	2.27%	2.18%	-0.09%	3.80%	0.20%	3.60%	3.51%
1994	-0.19%	3.37%	3.56%	2.21%	0.30%	1.91%	5.47%
1995	1.32%	2.61%	1.30%	5.20%	-0.20%	5.40%	6.70%
Averages							
[1986-94]	0.82%	3.00%	2.18%	2.98%	0.13%	2.85%	5.03%
[1986-95]	0.87%	2.96%	2.09%	3.20%	0.10%	3.10%	5.20%
[1987-95]	0.41%	3.03%	2.62%	3.27%	-0.01%	3.28%	5.90%
[1988-95]	0.39%	2.98%	2.58%	3.31%	0.05%	3.26%	5.84%
[1989-95]	0.68%	2.69%	2.01%	3.77%	0.01%	3.75%	5.76%
[1990-95]	1.18%	2.73%	1.55%	4.07%	-0.02%	4.09%	5.63%
[1991-95]	1.04%	2.62%	1.57%	3.51%	0.12%	3.39%	4.96%

APPENDIX D

MODIFIED FCC MODEL
(REVISED MATERIALS PRICE INDEX)
1985-1995

Chart D1: Components of FCC LEC Price Cap X-Factor [Excluding CPD]

Year	Input Price Growth Rates			Total Factor Productivity Growth Rates			LEC
	Total RBOCs	U.S. Nonfarm Business Sector	Differential	Total RBOCs	U.S. Nonfarm Business Sector	Differential	Price/Productivity Differential
	A	B	C=B-A	D	E	F=D-E	G=C+F
1984							
1985							
1986	5.20%	2.81%	-2.39%	2.84%	0.92%	1.92%	-0.47%
1987	0.73%	2.53%	1.80%	3.14%	-0.02%	3.16%	4.96%
1988	-1.37%	3.73%	5.10%	0.33%	0.46%	-0.13%	4.97%
1989	-2.38%	3.04%	5.42%	1.93%	-0.55%	2.48%	7.89%
1990	1.87%	3.31%	1.44%	6.85%	-0.47%	7.32%	8.76%
1991	-0.69%	2.06%	2.75%	2.19%	-0.89%	3.08%	5.83%
1992	2.80%	2.88%	0.08%	4.44%	1.10%	3.34%	3.42%
1993	2.48%	3.72%	1.24%	4.01%	0.55%	3.46%	4.70%
1994	-0.02%	3.50%	3.52%	2.38%	0.50%	1.88%	5.40%
1995	1.29%	3.09%	1.80%	5.18%	0.16%	5.02%	6.81%
Averages							
[1986-94]	0.96%	3.06%	2.11%	3.12%	0.18%	2.94%	5.05%
[1986-95]	0.99%	3.07%	2.08%	3.33%	0.18%	3.15%	5.23%
[1987-95]	0.52%	3.10%	2.57%	3.38%	0.09%	3.29%	5.86%
[1988-95]	0.50%	3.17%	2.67%	3.41%	0.11%	3.30%	5.97%
[1989-95]	0.76%	3.09%	2.32%	3.85%	0.06%	3.80%	6.12%
[1990-95]	1.29%	3.09%	1.81%	4.17%	0.16%	4.02%	5.82%
[1991-95]	1.17%	3.05%	1.88%	3.64%	0.28%	3.36%	5.23%

APPENDIX E

ORIGINAL FCC MODEL (REVISED BEA COMPOSITE ASSET PRICE)

1985-1995

Chart D1: Components of FCC LEC Price Cap X-Factor [Excluding CPD]

Year	Input Price Growth Rates			Total Factor Productivity Growth Rates			LEC
	Total RBOCs	U.S. Nonfarm Business Sector	Differential	Total RBOCs	U.S. Nonfarm Business Sector	Differential	Price/Productivity Differential
	A	B	C=B-A	D	E	F=D-E	G=C+F
1984							
1985							
1986	4.94%	2.81%	-2.13%	2.58%	0.92%	1.66%	-0.47%
1987	0.60%	2.53%	1.93%	3.00%	-0.02%	3.02%	4.96%
1988	-1.52%	3.73%	5.25%	0.18%	0.46%	-0.28%	4.97%
1989	-2.33%	3.04%	5.37%	1.97%	-0.55%	2.52%	7.89%
1990	1.82%	3.31%	1.49%	6.79%	-0.47%	7.26%	8.76%
1991	-0.92%	2.06%	2.98%	1.96%	-0.89%	2.85%	5.83%
1992	2.62%	2.88%	0.26%	4.26%	1.10%	3.16%	3.42%
1993	2.23%	3.72%	1.49%	3.77%	0.55%	3.22%	4.70%
1994	-0.28%	3.50%	3.78%	2.12%	0.50%	1.62%	5.40%
1995	1.16%	3.09%	1.93%	5.05%	0.16%	4.89%	6.81%
Averages							
[1986-94]	0.79%	3.06%	2.27%	2.96%	0.18%	2.78%	5.05%
[1986-95]	0.83%	3.07%	2.24%	3.17%	0.18%	2.99%	5.23%
[1987-95]	0.38%	3.10%	2.72%	3.23%	0.09%	3.14%	5.86%
[1988-95]	0.35%	3.17%	2.82%	3.26%	0.11%	3.16%	5.97%
[1989-95]	0.61%	3.09%	2.47%	3.70%	0.06%	3.65%	6.12%
[1990-95]	1.11%	3.09%	1.99%	3.99%	0.16%	3.83%	5.82%
[1991-95]	0.96%	3.05%	2.09%	3.43%	0.28%	3.15%	5.23%

APPENDIX F

FCC STAFF'S PRODUCTIVITY MODEL (6.5% X-factor basis)

1996-97 BOC Industry DATA UPDATE

PAGE 1

FCC CHART D2, D3	FCC Model	UPDATE	UPDATE
	1995	1996	1997
Inter. End User Revenue	\$5,770,285	\$5,930,960	\$6,268,026
S.O.C.C., Table 2.9, line 154	3.23%	2.78%	5.68%
Inter Switched Access	\$9,332,869	\$9,409,639	\$8,763,815
S.O.C.C., Table 2.9, line 155	0.42%	0.82%	-6.86%
Inter Special Access	\$2,529,667	\$3,070,598	\$3,851,028
S.O.C.C., Table 2.9, line 156	14.10%	21.38%	25.42%
<i>TOTAL INTERSTATE REVS</i>	<i>\$17,632,821</i>	<i>\$18,411,197</i>	<i>\$18,882,869</i>
	3.11%	4.41%	2.56%
Local Service Revenue	\$37,684,860	\$40,523,387	\$42,460,592
S.O.C.C., Table 2.9, line 153	5.39%	7.53%	4.78%
Intra. Toll & Access	\$13,123,225	\$12,987,476	\$12,308,613
S.O.C.C., Table 2.9, l 157+174	-8.59%	-1.03%	-5.23%
<i>TOTAL INTRASTATE REVS</i>	<i>\$50,808,085</i>	<i>\$53,510,863</i>	<i>\$54,769,205</i>
	1.38%	5.32%	2.35%
<i>GRAND TOT REVS (-MISC)</i>	<i>\$68,440,906</i>	<i>\$71,922,060</i>	<i>\$73,652,074</i>
	1.82%	5.09%	2.41%

FCC STAFF'S PRODUCTIVITY MODEL (6.5% X-factor basis)
1996-97 BOC Industry DATA UPDATE

PAGE 2

	FCC Model	UPDATE	UPDATE	
FCC CHART D4, D5	1995	1996	1997	
Switched Acc Line - <i>Mobile</i> SOCC Table 2.10	119,887,506 4.01%	125,333,996 4.54%	131,458,355 4.89%	
Switched Acc Minutes SOCC Table 2.10	334,981,582 332,335,499 12.30%	362,159,904 359,299,134 8.11%	387,587,697 384,526,068 7.02%	Estimated, using growth rates shown on to FCC '95 quantity
Special Acc Lines <i>Dig+Anlog</i> SOCC Table 2.10	16,107,677 16.52%	20,775,150 28.98%	24,479,958 17.83%	< revised vs. reported
Local Call Volume SOCC Table 2.10	409,383,799 4.27%	422,262,867 3.15%	433,086,737 2.56%	< revised vs. reported
Intrastate DEMs	246,926,539 4.91%	258,038,233 4.50%	269,649,954 4.50%	Est'd pending release of Joint Board Monitoring Report
FCC CHART D6				
Total Employees <i>Stat of C. C. Table 2.9, line 321</i>	346,843 -5.54%	338,040 -2.54%	338,177 0.04%	
Total Compensation \$000 <i>Stat of C. C. Table 2.9, line 324</i>	\$16,203,522 -5.54%	\$16,597,889 2.43% normalized vs. reported	\$17,451,673 5.14%	

FCC STAFF'S PRODUCTIVITY MODEL (6.5% X-factor basis)
 1996-97 BOC Industry DATA UPDATE

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FCC CHART D7	FCC Model	UPDATE	UPDATE
	1995	1996	1997
TPIS - BOY	\$209,325,562	\$217,430,207	\$227,317,120
SOCC, Tab 2.7 (Ac260-2111)	3.07%	3.87%	4.55%
Unadj. Additions	\$15,374,568	\$18,026,150	\$18,253,199
SOCC, Tab 2.7 (Ac260-2111)	4.46%	17.25%	1.26%
TPIS - EOY	\$217,430,207	\$227,317,120	\$236,896,179
SOCC, Tab 2.7 (Ac260-2111)	3.87%	4.55%	4.21%
<i>Retires = BOY+Adds-EOY</i>	<i>\$7,269,923</i>	<i>\$8,139,237</i>	<i>\$8,674,140</i>
Depreciation Accruals	\$15,358,553	\$16,252,281	\$16,667,034
SOCC Tabl 2.9, I 250+252	3.33%	5.82%	2.55%

FCC STAFF'S PRODUCTIVITY MODEL (6.5% X-factor basis)
 1996-97 BOC Industry DATA UPDATE

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FCC CHART D8	FCC Model	UPDATE	UPDATE
	1995	1996	1997
Operating Expense SOCC Tabl 2.9, line 280	\$56,831,094 1.63%	\$57,884,494 1.85%	\$59,731,175 3.19%
Depreciation & Amortiz. SOCC Tabl 2.9, line 255	\$15,556,284 3.24%	\$16,377,242 5.28%	\$16,758,832 2.33%
Employee Compensation Stat of C. C. Table 2.9, line 324	\$16,203,522 -5.54%	\$18,457,448 13.91%	\$17,451,673 -5.45%
Materials = OpExp-Dep-Comp calc	\$25,071,288 5.81%	\$23,049,804 -8.06%	\$25,520,670 10.72%

USTA 1996/97 UPDATE OF FCC PRODUCTIVITY MODEL
MODEL DATA ADJUSTMENTS TO REPORTED BOC INDUSTRY DATA

Item	YEAR	Model Exhibit	Data Item	BOC Total REPORTED	BOC Total REVISION/Estimate	% CHG	EXPLANATION
1	1996	D5	Intrastate DEMs	Not released	258,038,233,255	4.50% over '95	Estimate, pending release of latest Joint Board Monitoring Report
2	1996	D4	Switch Acc Minutes	Not released	362,159,903,714	8.11% over '95	Estimate, pending Joint Board publication Used growth rates for Interstate interlata billed access minutes from Table 2.10, Stat. Of Comm. Common Carriers
3	1996	D6	Labor Compensation	\$18,457,448,000	16,597,889,075	-10.07%	Normalized value substituted to reflect change in reporting basis after FCC clarification to include benefits \$
1	1997	D5	Intrastate DEMs	Not released	269,649,953,751	4.50% over '96	Estimate, pending release of latest Joint Board Monitoring Report
2	1997	D4	Switch Acc Minutes	Not released	387,587,696,669	7.02% over '96	Estimate, pending Joint Board publication Used growth rates for Interstate interlata billed access minutes from Table 2.10, Stat. Of Comm. Common Carriers
3	1997	D5	Local Calls (000)	408,389,023,000	433,086,737,000	6.05%	Revision to New York Tel.
4	1997	D4	Special Acc Lines	27,891,558	24,479,958	-12.23%	Revision to US West Revision to New York Tel.

Review of USTA TFPRP Model

Statement of Professor Frank M. Gollop

Boston College

October 22, 1998

Review of USTA TFPRP Model
Statement of Professor Frank M. Gollop
Boston College
October 22, 1998

I have been asked by USTA to review its TFPRP model to audit the economic and spreadsheet logic of the model and to determine whether the model has been appropriately updated through 1997. I have completed that task. My overall assessment is that USTA's TFPRP model is internally consistent, defines TFP growth in an economically meaningful and consistent way, and properly updates its code to apply to both 1996 and 1997.

The program is initialized with (a) company-specific data for LECs and (b) a set of data of economy-wide price and TFP data for the U.S. economy. I have not audited the primary LEC data and so offer no opinion on their validity. However, I prepared the updated U.S. economy data for 1996 and 1997 for the USTA model and have determined that the updated economy-wide data are properly linked to the earlier series ending in 1995. I have also determined that the company data are properly summed to form industry totals for the industry-level analysis.

The spreadsheet logic is not only internally consistent but also applies a standard model of TFP accounting. Growth rates of price and quantity data entering into any calculation leading ultimately to the measurement of TFP or the X-Factor are consistently defined in logarithms. When aggregate growth rates are formed, arithmetic averages of the appropriate cost or revenue shares are applied. This is the standard Tornquist indexing technique. It is applied to the measurement of industry output, inputs, and TFP. All spreadsheet commands introduced for both 1996 and 1997 are proper extensions of formulas applied in earlier years. The updated data are treated identically to those for earlier years.

My overall assessment is that the updated USTA TFPRP model contains no spreadsheet coding errors. Moreover, its design and results are consistent with standard TFP accounting practice.

Curriculum Vitae

Frank M. Gollop

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CURRICULUM VITAE

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ACADEMIC APPOINTMENTS:

Professor of Economics, Boston College, 1985-Present

Associate Professor of Economics, Boston College, 1979-1985.

Assistant Professor of Economics, University of Wisconsin-Madison, 1974-1979.

GRADUATE STUDIES:

Harvard University: A.M., November 1972; Ph.D., July 1974

Ph.D. Thesis: Modeling Technical Change and Market Imperfections: An Econometric Analysis of U.S. Manufacturing, 1947-1971.

UNDERGRADUATE STUDIES:

University of Santa Clara: A.B. in Economics, June 1969;
 A.B. in Philosophy, June 1970

SPECIAL APPOINTMENTS:

Economic Classification Policy Committee, Expert Consultant to U.S. Government, 1992-Present.

HONORS, AWARDS and GRANTS:

U.S. Department of Agriculture Grant 1995-98
National Science Foundation Grant, 1992-94
U.S. Department of Agriculture Grant 1992-97
U.S. Bureau of the Census Grant, 1985-87
U.S. Bureau of the Census Grant, 1984-86
Federal Trade Commission Grant, 1984
Research Fellowship, Boston College, 1984
Summer Research Grant, Boston College, 1983
U.S. Bureau of the Census Grant, 1983
U.S. Bureau of the Census Grant, 1982
U.S. Department of Commerce Grant, 1982
Center for Economic Development Grant, 1982
Federal Energy Regulatory Commission Grant, 1980
U.S. Department of Labor Grant, 1979-1980
U.S. Department of Commerce Grant, 1978-1979

Graduate School Research Committee Grant, Univ. of Wisconsin, 1979
 National Science Foundation Grant, 1977-1978
 Graduate School Research Committee Grant, Univ. of Wisconsin, 1978
 Graduate School Research Committee Grant, Univ. of Wisconsin, 1977
 Department Fellow, Harvard University, 1971-1972
 University Fellowship, University of Santa Clara, 1965-1969

PROFESSIONAL SOCIETIES:

American Economic Association
 Conference on Research in Income and Wealth
 Eastern Economic Association
 Western Economic Association

RECENT REFEREEING ACTIVITY:

American Economic Review, National Science Foundation, Review of Economics and Statistics, Land Economics, Southern Economic Journal, The Canadian Journal of Economics, Journal of Environmental Economics and Management, Review of Industrial Organization, American Journal of Agricultural Economics.

PUBLICATIONS:

"Structural Inflation in the United States, 1964-1966," The American Economist, 13, No. 2 (Fall 1969), pp. 31-39.

"The Impact of the Fuel Adjustment Mechanism on Economic The Review of Economics and Statistics, 60, No. 4 (November 1978), pp. 574-84 (with Stephen Karlson).

"Firm Interdependence in Oligopolistic Markets," The Journal of Econometrics, 10 (April 1979), pp. 313-331 (with Mark Roberts).

"Accounting for Intermediate Input: The Link Between Sectoral and Aggregate Measures of Productivity Growth," in A. Rees and J. Kendrick (eds.), The Measurement and Interpretation of Productivity. Washington, D.C.: National Academy of Sciences, 1979.

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ATTACHMENT E

**USTA COMMENTS
CC DOCKET NO. 96-262
OCTOBER 26, 1998**

USTA Pricing Flexibility Proposal

Relevant Market			
Geographic Components		Service Components	
MSA, contiguous MSAs, or a LATA	Transport	Switched Access	
		Residence and SL Business	Multi-Line Business
Phase 1			
Transport Competitive Trigger		Regulatory Flexibility for Phase 1 Services	
State approved interconnection agreement or SGAT, and customers are utilizing alternative transport services		<ul style="list-style-type: none">• New services relief:<ul style="list-style-type: none">- No public interest showing- No cost support• Eliminate Part 69 codification• Price deaveraging• Expanded volume and term pricing• Contract pricing• Promotional pricing	
Switched Access Competitive Trigger			
State approved interconnection agreement or SGAT, and customers are utilizing alternative switched access services			
Phase 2			
Transport Competitive Trigger		Regulatory Flexibility for Phase 2 Services	
25% of ILEC's transport demand is addressable through collocation arrangements or alternative networks, and customers are utilizing these alternative transport services		<ul style="list-style-type: none">• "X" Factor = GDPPI and no LFAM• Simplified price cap basket structure	
Switched Access Competitive Trigger			
25% of ILEC's local exchange service demand (in total or by residence/SL business vs. ML business service components) is addressable through UNEs sold to competitors or through alternative facilities, and customers are utilizing these alternative switched access services			
Phase 3			
Competitive Trigger		Regulatory Flexibility for Phase 3 Services	
Competitors are capable of serving at least 75% of the market as defined in Phase 2, and customers are utilizing these alternative access services		Services removed from price caps	

ATTACHMENT F

**USTA COMMENTS
CC DOCKET NO. 96-262
OCTOBER 26, 1998**

ILEC PRICE CAP STRUCTURE PROPOSED

